IMPROVING PHYSICAL ACTIVITY AND FRUIT AND VEGETABLE SOCIAL COGNITIVE AND BEHAVIOR VARIABLES IN FILIPINO ADOLESCENTS IN HAWAIʻI: THE WAIPAHU HART PROJECT

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DEDICATION

This dissertation is dedicated to my family and friends

for their support and confidence in me.

ABSTRACT

Filipino adolescents are one of the most overweight ethnic groups in Hawai‘i. With limited research on health behaviors of Filipino adolescents (age 10-19), it is important to have research that focuses on decreasing health disparities in this adolescent population. This study aims to fill the gap on Filipino adolescent physical activity (PA) and fruit and vegetable (FV) social cognitive and behaviors using the Social Cognitive Theory through peer influence to create positive health behaviors, examine Multiple Health Behavior Change (MHBC) and if peer educators (PEs) change their health behaviors through teaching a health curriculum. The Waipahu Health Action Research and Training (HART) project is a quasi-experimental design peer-influence study based at Waipahu High School (WHS). It includes three manuscripts: 1) use peer influence to increase PA and FV social cognitive and behavior variables in Filipino adolescents, 2) examine transfer and compensation effects of PA, FV consumption, and sedentary behavior (SB) in Filipino adolescents and 3) examine if PEs increase their PA and FV social cognitive and behavior variables through teaching a health curriculum. Participants were all Filipino students from nine WHS health classes (5 intervention, 4 control). PEs were Filipino senior health capstone class at WHS. Findings suggest a peer-led PA and nutrition curriculum can benefit participants and PEs in terms of PA social cognitive and behavior variables. Multiple regression analysis showed for the intervention group follow-up PA knowledge is 0.62 units (SE=0.15, $p<0.01$) higher and follow-up Moderate-Vigorous PA (MPVA) is 20.04 min/week (SE=6.13, $p<0.01$) higher than the control group. A trend towards follow-up PA enjoyment for the intervention group being 0.41units (SE=0.23, $p=0.09$) higher than the control group was seen. PA knowledge had a significant interaction for AT RISK (Stage of Change pre-contemplation, contemplation and preparation) ($F(1, 65)=6.69$, $p<0.01$). A trend towards a transfer effect of PA

for Low vs. High SB ($F(1, 76)=3.76$, $p=0.06$) was seen. PEs increased their PA stage of change ($F(1, 18) =5.51$, $p=0.03$) and MVPA ($F(1, 18)=7.44$, $p<0.01$) through teaching the HART curriculum. Given currently limited research on Filipino adolescents' health behaviors, this dissertation adds to the literature and gives guidance for future research.

TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF ABBREVIATIONS

AAPI	Asian American and Pacific Islander
CDC	Center for Disease Control
CHB	Compensatory Health Belief
df	Degrees of Freedom
DOE	Department of Education
FITT	Frequency, Intensity, Time and Type
FV	Fruit and Vegetables
HART	Health Action Research and Training
HMSA	Hawai‘i Medical Service Association
MHBC	Multiple Health Behavior Change
MVPA	Moderate and Vigorous Physical Activity
OPI	Other Pacific Islander
PA	Physical Activity
PCs	Project Coordinators
PACES	Physical Activity Enjoyment Scale
PEs	Peer Educators
PI	Pacific Islander
SB	Sedentary Behavior
SD	Standard Deviation
SE	Standard Error
SPSS	Statistical Package for the Social Sciences
SCT	Social Cognitive Theory

TTM	Transtheoretical Model
WHS	Waipahu High School
US	United States
YRBSS	Youth Risk Behavior Surveillance System

CHAPTER 1: OVERVIEW OF DISSERTATION

Introduction

In 2010, there were 3.4 million Filipinos (alone-or-in-any-combination) living in the United States (US) with 10% of the population residing in the state of Hawai'i.[1] Health behavior research on Asian American's and Pacific Islander (AAPI) populations (which include Filipinos) is often lumped into a singular entity, usually due to having a small sample size compared to other ethnic/racial groups.[2] Given that Asians are the fastest-growing minority in the United States,[1] research needs to distinguish the differences in cultures, the variability in health and health behavior, in these ethnicities.[3,4] Filipinos are the third largest Asian subgroup in the US and 70% more likely to be obese as compared to the overall Asian population.[5] They are also one of the most underrepresented populations in health research.[4,5] With limited research targeting Filipinos, especially adolescents (ages 10-19), and chronic diseases such as diabetes, cancer, heart disease, and obesity on the rise, a culturally tailored adolescent intervention study is warranted.[4,6] The purpose of this dissertation is to: 1) use peer influence to increase physical activity (PA) and fruit and vegetable (FV) social cognitive and behavior variables in Filipino adolescents; 2) examine transfer and compensation effect for PA, FV and sedentary behaviors (SB) in Filipino adolescents; and, 3) investigate if adolescents acting as peer educators (PEs) can change their PA and FV social cognitive and behavior variables.

Rationale

While adolescence is a healthy time of life, two important public health problems begin to emerge: lack of PA and poor nutrition habits.[7,8] Health behaviors established during this development period determine an adolescent's current health status and risk for developing chronic diseases in adulthood.[7] In 2015, among Filipino high school adolescents, only 16% ate 5

or more FV per day compared to Caucasian (21%), Native Hawaiian (19%) and Other Pacific Islander (OPI) (23%).[9] Only 15% met the PA guideline for at least 60 minutes per day of moderate and vigorous PA compared to Caucasian (20%), Native Hawaiian (26%) and OPI (18%).[10] For SB, 53% had 2 hours or less of computer and video game time on an average school day compared to Caucasian (63%), Native Hawaiian (63%) and OPI (74%).[11] The combination of being inactive and having low FV consumption during adolescence increases the likelihood of developing chronic diseases.[12,13]

Adolescence is a critical transition time where physiological changes are happening, independence increases, and experimentation takes place.[14] During this transitional time, health behaviors are highly influenced by peers, family, school, community and society.[2] All of which are dimensions of an adolescent's culture that makes them who they are.[15] In a traditional Filipino culture, an individual is seen as part of the family and community and actions are taken for these groups rather than for individual gain.[16,17] Filipino adolescents born in Hawai'i though may be more acculturated than first generation Filipinos.[15] Briefly, acculturation is a process of adopting cultural traits of another group that one is becoming a part of and can also be thought of as learning a second culture.[15] Thus, due to continuous contact with other ethnicities in Hawai'i, second or third generation Filipino adolescents may change their health behaviors.[15] American Filipino adolescent intervention programs need to be aware of both cultural values as well as acculturation of the population to counteract negative health behaviors.[15,18] An appropriately tailored health behavior intervention focused on Filipino adolescents could help prevent poor health behaviors developed during adolescence by providing the support, experience, and resources to become healthy adults.[6,18]

Theory-based interventions are an effective way to create health behavior change. The

Social Cognitive Theory (SCT) is one of the most utilized theories in health behavior research that focuses on both predictors and principles to enable, guide, and motivate people to adopt and promote health behaviors.[19] The premise of the SCT is that behavior change is made possible by a personal sense of control.[19] SCT focuses on three interacting factors that create this sense of control resulting in behavior change; cognitive behavior, and environment.[19]

Until recently, interventions to improve health behavior have tended to focus on individual health behavior risk.[20] Most adolescents engage in multiple health risk behaviors that increase chances of disease and mortality.[21-24] The use of Multiple Health Behavior Change (MHBC) interventions for advancing health promotion may offer great potential and advancement to health research and help address the health needs of the population in the future.[25] MHBC addresses two or more health behaviors either simultaneously or sequentially, within a limited time.[25] Comprehension of ways to change multiple health behavior risks and the motivations for those changes is crucial in designing successful intervention programs.[22] PA and FV behaviors may act as gateway behaviors that when changed may lead to positive change in another health behavior.[22] Two theories that can assist in gaining a better understanding of gateway behaviors and how they lead to change are the Compensatory Health Belief (CHB) theory and the transfer effect theory.

A CHB is the belief a person holds about neutralizing or compensating for the effects of a negative health behavior by engaging in a healthier behavior.[26,27] CHB is a person's justification to engage in negative health behavior.[28] The model attempts to explain why people develop CHB, employ them to control/resist temptations, and their ability to predict health choices.[28] The major components of the model are cognitive dissonance, goal self-concordance, self-efficacy, and implementation plans.[28]

The opposite belief, transfer effect, holds that a person will transfer their confidence and knowledge from one good health behavior to another health behavior that needs improvement.[22] Transfer effect is taken from research on learning and teaching and may depend on the co-occurrence of health behaviors, the similarity of the health behaviors,[29] and an individual's ability to take skills learned to another behavior.[30] As Filipino adolescents in Hawai'i fall short of recommended PA and FV behaviors,[9,10] the examination of compensation and transfer effect of these health behaviors may aid future intervention research and have yet to be explored in Filipino adolescents in Hawai'i.

Another promising approach involves peer-led initiatives.[31-33] PEs are individuals from the same population who are trained to assist in or educate the target population.[34] The use of PEs is rooted in the SCT, where an individual's attitude and behavior can be influenced by the interaction and observation of others.[19] PEs can be positive role models who directly affect their social environment to help change health behaviors.[31-33] Studies using peer-led initiatives have shown PEs can improve their self-efficacy, knowledge, attitudes and behaviors as well as those of their peers.[31,32] Peer education has not been examined to a significant degree in Filipino adolescents and could have the potential to impact health behavior.

Problem Statement

In an article by Joyce et al[4] for the Center for Disease Control (CDC), Filipino children have higher rates of health disparities, such as gestational diabetes and being overweight and inactive, when compared to other ethnicities of the same age. Since Filipino adolescents are one of the most overweight ethnicity groups in Hawai'i, it is important to have research that focuses on decreasing health disparities in this population.[35] Regular PA and consuming FV are associated with many health benefits including reduced risk of type 2-diabetes, obesity, heart

disease, and some cancers.[36] A peer-led health curriculum using predominately Filipino adolescents as PEs to change PA and FV social cognitive and behavior variables in younger Filipino adolescents is warranted in this population. Therefore, the current research study will meet this lack of research on limited PA and FV social cognitive and behavior variables in Filipino adolescent by testing the effect of a peer-led health curriculum on Filipino adolescents and their PEs. It will also be the first studies to examine transfer and compensation effect for PA, FV, and SB in Filipino adolescents.

Research questions

The research questions this dissertation will address are listed below by manuscript.

Manuscript 1: Can a peer-led PA and nutrition curriculum change PA and FV social cognitive and behavior variables in Filipino adolescents in Hawai‘i?

Manuscript 2: Is there a transfer or compensation effect for PA, FV consumption, and SB in Filipino adolescents in Hawai‘i?

Manuscript 3: Can Filipino adolescents change their PA and FV social cognitive and behavior variables through teaching a PA and nutrition curriculum to their peers?

References

1. The Asian Population: 2010. United States Department of Commerce Economics and Statistics Administration; 2010. https://www.census.gov/newsroom/releases/archives/2010_census/cb12-cn22.html.

2. Yang F, Tan KA, Cheng WJ. The effects of connectedness on health-promoting and health-compromising behaviors in adolescents: evidence from a statewide survey. *J Prim Prev.* 2014;35(1):33-46.

3. Nigg C, Shor B, Tanaka CY, Hayes DK. Adolescent at-risk weight (overweight and obesity) prevalence in Hawai'i. *Hawaii Med J.* 2011;70(7 Suppl 1):4-10.

4. Joyce J, Lynne H, Fernando M. Filipino Child Health in the United States: Do Health and Health Care Disparities Exist? *Preventing Chronic Disease.* 2007;4(2):20. https://www.cdc.gov/pcd/issues/2007/apr/06_0069.htm.

5. Obesity and Asian Americans. 2015; http://minorityhealth.hhs.gov/omh/browse.aspx?lvl=4&lvlID=55. Accessed May 2016.

6. Dirige OV, Carlson JA, Alcaraz J, et al. Siglang Buhay: nutrition and physical activity promotion in Filipino-Americans through community organizations. *J Public Health Manag Pract.* 2013;19(2):162-168.

7. Mulye TP, Park MJ, Nelson CD, Adams SH, Irwin CE, Brindis CD. Trends in adolescent and young adult health in the United States. *J Adolesc Health.* 2009;45(1):8-24.

8. Nelson MC, Gordon-Larsen P. Physical activity and sedentary behavior patterns are associated with selected adolescent health risk behaviors. *Pediatrics.* 2006;117(4):1281-1290.

9. PAN Plan Target Teen Fruit and Vegetable Consumption. 2015; http://www.hawaiihealthmatters.org/modules.php?op=modload&name=NS-Indicator&file=indicator&indid=3000263000407&iid=11662171, 2016.

10. Teens Who Meet Aerobic Physical Activity Guidelines 2015. 2015; http://www.hawaiihealthmatters.org/modules.php?op=modload&name=NS-Indicator&file=indicator&indid=3000523000407&iid=11651993, 2016.

11. Teens with 2 Hours of Less of Computer and Video Game Time. Hawaii Department of Health; 2015. http://www.hawaiihealthmatters.org/index.php?module=indicators&controller=index&action=view&indicatorId=1869&localeId=14. Accessed September 9, 2016.

12. Lowry R, Michael S, Demissie Z, Kann L, Galuska DA. Associations of Physical Activity and Sedentary Behaviors with Dietary Behaviors among US High School Students. *J Obes.* 2015;2015:876524.

13. Prochaska JJ, Sallis JF. A randomized controlled trial of single versus multiple health behavior change: promoting physical activity and nutrition among adolescents. *Health Psychol.* 2004;23(3):314-318.

14. Birkhead GS, Riser MH, Mesler K, Tallon TC, Klein SJ. Youth development is a public health approach. Introduction. *J Public Health Manag Pract.* 2006; Suppl: S1-3.

15. Chakraborty BM, Chakraborty R. Concept, measurement and use of acculturation in health and disease risk studies. *Coll Antropol.* 2010;34(4):1179-1191.

16. Watkins D, Gerong A. Culture and spontaneous self-concept among Filipino college students. *J Soc Psychol.* 1997;137(4):480-488.

17. Pe-Pua R, Protacio-Marcelino E. Sikolohiyang Pilipino (Filipino psychology): A legacy of Virgilio G. Enriquez. *Asian Journal of Social Psychology.* 2000;3:49 - 71.

18. Grunbaum JA, Lowry R, Kann L, Pateman B. Prevalence of health risk behaviors among Asian American/Pacific Islander high school students. *J Adolesc Health.* 2000;27(5):322-330.

19. Bandura A. Health promotion by social cognitive means. *Health Educ Behav.* 2004;31(2):143-164.

20. Busch V, de Leeuw JR, de Harder A, Schrijvers AJ. Changing multiple adolescent health behaviors through school-based interventions: a review of the literature. *J Sch Health.* 2013;83(7):514-523.

21. Moy KL, Sallis JF, Ice CL, Thompson KM. Physical activity correlates for Native Hawaiians and Pacific Islanders in the mainland United States. *J Health Care Poor Underserved.* 2010;21(4):1203-1214.

22. Nigg CR, Lee HR, Hubbard AE, Min-Sun K. Gateway health behaviors in college students: investigating transfer and compensation effects. *J Am Coll Health.* 2009;58(1):39-44.

23. King TK, Marcus BH, Pinto BM, Emmons KM, Abrams DB. Cognitive-behavioral mediators of changing multiple behaviors: smoking and a sedentary lifestyle. *Prev Med.* 1996;25(6):684-691.

24. Strecher V, Wang C, Derry H, Wildenhaus K, Johnson C. Tailored interventions for multiple risk behaviors. *Health Educ Res.* 2002;17(5):619-626.

25. Prochaska JJ, Nigg CR, Spring B, Velicer WF, Prochaska JO. The benefits and challenges of multiple health behavior change in research and in practice. *Prev Med.* 2010;50(1-2):26-29.

26. Knauper B, Rabiau M, Cohen O, Patriciu N. Compensatory health beliefs: scale, development and psychometric properties. *Psychology of Health.* 2004;19:607-624.

27. Kaklamanou D, Armitage CJ. Testing compensatory health beliefs in a UK population. *Psychol Health.* 2012;27(9):1062-1074.

28. Rabiau M, Knauper B, Miquelon P. The eternal quest for optimal balance between maximizing pleasure and minimizing harm: The compensatory health beliefs model. *British Journal of Health Psychology.* 2006(11):139-153.

29. Flay B, Petraitis J, eds. *The Theory of Triadic Influence: a New Theory of Health Behavior with Implications for Preventive Interventions.* Greenwich, CT: JAI Press; 1994. G A, ed. Advances in Medical Sociology, A Reconsideration of Models of Health Behavior Change; No. IV.

30. Perkins D, Salmon G, eds. *Transfer and Learning.* 2nd ed: Pergamom Press; 1994. Husen T, Postlethwaite T, eds. International Encyclopedia of Education.

31. Story M, Lytle LA, Birnbaum AS, Perry CL. Peer-led, school-based nutrition education for young adolescents: feasibility and process evaluation of the TEENS study. *J Sch Health.* 2002;72(3):121-127.

32. Stock S, Miranda C, Evans S, et al. Healthy Buddies: a novel, peer-led health promotion program for the prevention of obesity and eating disorders in children in elementary school. *Pediatrics.* 2007;120(4):e1059-1068.

33. Gittelsohn J, Dennisuk LA, Christiansen K, et al. Development and implementation of Baltimore Healthy Eating Zones: a youth-targeted intervention to improve the urban food environment. *Health Educ Res.* 2013;28(4):732-744.

34. Khan NA, Nasti C, Evans EM, Chapman-Novakofski K. Peer education, exercising, and eating right (PEER): training of peers in an undergraduate faculty teaching partnership. *J Nutr Educ Behav.* 2009;41(1):68-70.

35. Hawaii Health Matters: Teens who are Obese. 2015; http://www.hawaiihealthmatters.org/index.php?module=indicators&controller=index&action=view&indicatorId=1312&localeId=14. Accessed September 2, 2016.

36. Penedo FJ, Dahn JR. Exercise and well-being: a review of mental and physical health benefits associated with physical activity. *Curr Opin Psychiatry.* 2005;18(2):189-193.

CHAPTER 2: LITERATURE REVIEW

A summary of the literature using the SCT (Table 1), MHBC (Table 2), and adolescents teaching health behavior (Table 3) is provided in Appendix A. Studies were included based on having matching or similar adolescent populations (Filipino only or Asian, ages 10-19, high school, 9th graders – 12th graders), intervention component (PA and/or nutrition curriculum, peer-led, school based), or outcome assessments (questionnaire, short FV food frequency questionnaire, PA, stage of change for FV or PA, self-efficacy for PA or FV, nutrition knowledge, PA knowledge, PA enjoyment, and SB) as the Waipahu HART project.

Using SCT to address health behavior change in Filipino adolescents

Many studies have used the SCT theory in addressing health behavior change in adolescents.[1-14] There were no studies found that used the SCT addressing health behavior change in Filipino adolescents, but six[1-6] were found to have included Asian adolescents in the studied population. Of these six studies, two were longitudinal in design,[1,6] three were cross-sectional,[3-5] and one study was an evaluation that reported on lessons learned in the development of a program.[2] Lytle et al[6] is the only longitudinally designed study to address health behavior change in adolescents and included a component that focused on the effect of peer influence in changing adolescent health behaviors. Results from this study found significant differences in food choice scores between intervention and control at follow-up, showing that a nutrition curriculum, with lessons led by peers, could help change health behaviors. Chen et al[1] while longitudinal in design, only published the rationale, design, and methodology for their study on Chinese children and adolescents, but did not publish findings from their study. The study by Park et al[2] is an evaluation of the feasibility of a learning module using Facebook to promote PA and nutrition to Korean adolescents. The other two studies were both cross-sectional studies and

addressed stages of change in Korean adolescents[3] and social support, self-efficacy, and perceived benefits/barriers to PA in Taiwanese adolescents.[4] Both studies found self-efficacy (SE), perceived benefits, and perceived barriers to be significantly correlated to PA. In addition, both studies found SE had the highest correlation with PA and perceived barriers had a negative correlation.[3,4] These findings show that the SCT has the promise to explain health behaviors in Filipino adolescents, but further research is needed in longitudinally designed studies to help explain social cognitive variables to change health behaviors.

Addressing MHBC in Filipino Adolescents

MHBC has been studied with substance abuse in adolescents[15-28] and ten studies addressed PA, nutrition, and/or SB.[15,29-37] Six of these studies included Asian adolescents in the study population for addressing MHB,[29-34] but none were found including only Filipino adolescents. A cross-sectional study by Wada et al[32] examined whether AA, PI adolescents, and young adult survivors of childhood cancer (AYASCC) had a higher prevalence of adverse health behaviors (PA and nutrition) compared to individuals their same age from Hawai‘i and mainland United States. They found AYASCC adolescent survivors met recommended MVPA guidelines to a greater extent ($p<0.001$) than Hawaiian and US adolescents but ate less of the recommended servings of FV per day ($p<0.001$). Kaplan et al[30] addressed the prevalence of unhealthy nutrition and SB in California Vietnamese adolescents. Results found females were significantly more sedentary than males ($p<0.001$) and no significant difference in consumption of recommended servings of FV by gender.[30] The last four studies were longitudinal in design, used self-report questionnaires and gave a mixture of results for MHBC.[29,31,33,34] Three of these studies were school-based interventions and addressed PA, nutrition, and/or SB changes.[29,33,34] All three studies saw improvement in PA and FV consumption from baseline to follow-up,[29,33,34] while

only two of the studies addressed SB also and these studies saw decreases in SB from baseline to follow-up.[33,34] De le Haye[31] used an after school program to assess if the association among health behavior could be explained by underlying health risk. Results showed PA did not relate to underlying risk factors and unhealthy eating and sedentary behavior revealed no significant difference in reliability over time.[31] These studies show that MHBC can be changed through school-based programs, but research is warranted to focus on Filipino adolescents' health behavior change. Lastly, none of these MHBC studies addressed compensation and transfer effects of health behaviors in adolescents nor had peers leading the intervention.

Adolescent peer-led health curriculums

Adolescent peer-led health promotion initiatives have been used in both substance abuse prevention[38,39] and obesity prevention programs.[40-42] However, there are few studies or programs to be found measuring adolescents as PEs quantitatively changing their PA and FV social cognitive and behavior variables, especially in Filipino adolescents.[40-42] One study was found that included Asian adolescents as health instructors.[41] The study design was longitudinal and used a health curriculum to change nutrition behavior in adolescents. However, the PEs were only measured qualitatively at follow-up after the first year. Observational measures found students enjoyed being peer-leaders and thought they learned more and ate better through becoming peer-leaders.[41] This study supports that a peer-led health curriculum has the potential to change health behaviors in peer-leaders, and has good feasibility as a health curriculum intervention component.

The purpose of this dissertation is to determine the effect of a peer-led PA and nutrition curriculum that promotes positive PA and FV consumption and examine the occurrence of transfer and compensation in Filipino adolescents. The first manuscript reviews the effect of the

peer-led PA and nutrition curriculum on Filipino adolescents between 9th and 11th grade (age 13-18) changing their PA and FV social cognitive and behavior variables over time. The second manuscript examines MHBC, in the same population over time, for transfer and compensation effect of PA, FV and SB behaviors. The final manuscript reviews changes in PEs social cognitive and behavior variables for PA and FV through teaching the PA and nutrition curriculum to their underclass (9th-11th grade) peers. This study intends to bridge the gap in research on Filipino adolescent health behaviors through the SCT using adolescent PEs teaching a PA and FV health curriculum.

Waipahu HART Time Frame and Conceptual Framework

The HART time frame (Appendix B) displays the relatedness of the three manuscripts and where they fall in implementing the overall HART project. The conceptual framework shows (Appendix C) which social cognitive and behavior variables each manuscript is focused on and how it leads towards the longer-term outcome of preventing chronic disease in Filipinos. The timeline and framework incorporate the SCT model that behavior change is determined by cognitive, behavior and environmental factors.[43] The intervention targets each of these factors through addressing knowledge and attitudes (cognitive), self-efficacy and practice (behavioral) and the influence of other factors (environmental) throughout the delivery of the PA and nutrition curriculum. Cognitive and behavioral factors are measured with the HART PA and nutrition questionnaire. The use of PEs to implement the curriculum is the environmental factor of the study.

References

1. Chen Y, Ma L, Ma Y, et al. A national school-based health lifestyles interventions among Chinese children and adolescents against obesity: rationale, design, and methodology of a randomized controlled trial in China. *BMC Public Health.* 2015;15:210-219.

2. Park BK, Nahm ES, Rogers VE. Development of a Teen-Friendly Health Education Program on Facebook: Lessons Learned. *J Pediatr Health Care.* 2015.

3. Kim YH. Korean adolescents' exercise behavior and its relationship with psychological variables based on stages of change model. *J Adolesc Health.* 2004;34(6):523-530.

4. Wu TY, Pender N. Determinants of physical activity among Taiwanese adolescents: an application of the health promotion model. *Res Nurs Health.* 2002;25(1):25-36.

5. Martin JJ, McCaughtry N, Flory S, Murphy A, Wisdom K. Using social cognitive theory to predict physical activity and fitness in underserved middle school children. *Res Q Exerc Sport.* 2011;82(2):247-255.

6. Lytle LA, Murray DM, Perry CL, et al. School-based approaches to affect adolescents' diets: results from the TEENS study. *Health Educ Behav.* 2004;31(2):270-287.

7. Rinderknecht K, Smith C. Social cognitive theory in an after-school nutrition intervention for urban Native American youth. *J Nutr Educ Behav.* 2004;36(6):298-304.

8. Downs DS, Graham GM, Yang S, Bargainnier S, Vasil J. Youth exercise intention and past exercise behavior: examining the moderating influences of sex and meeting exercise recommendations. *Res Q Exerc Sport.* 2006;77(1):91-99.

9. Najimi A, Ghaffari M. Promoting fruit and vegetable consumption among students: a randomized controlled trial based on social cognitive theory. *J Pak Med Assoc.* 2013;63(10):1235-1240.

10. Gillison FB, Standage M, Skevington SM. Relationships among adolescents' weight perceptions, exercise goals, exercise motivation, quality of life and leisure-time exercise behavior: a self-determination theory approach. *Health Educ Res.* 2006;21(6):836-847.

11. Hamilton K, White KM. Extending the theory of planned behavior: the role of self and social influences in predicting adolescent regular moderate-to-vigorous physical activity. *J Sport Exerc Psychol.* 2008;30(1):56-74.

12. Motl RW, Dishman RK, Ward DS, et al. Examining social-cognitive determinants of intention and physical activity among black and white adolescent girls using structural equation modeling. *Health Psychol.* 2002;21(5):459-467.

13. El Hamid Hussein RA. Can knowledge alone predict vegetable and fruit consumption among adolescents? A transtheoretical model perspective. *J Egypt Public Health Assoc.* 2011;86(5-6):95-103.

14. Plotnikoff RC, Lubans DR, Costigan SA, et al. A test of the theory of planned behavior to explain physical activity in a large population sample of adolescents from Alberta, Canada. *J Adolesc Health.* 2011;49(5):547-549.

15. Peralta LR, Jones RA, Okely AD. Promoting healthy lifestyles among adolescent boys: the Fitness Improvement and Lifestyle Awareness Program RCT. *Prev Med.* 2009;48(6):537-542.

16. Werch CC, Moore MJ, DiClemente CC, Bledsoe R, Jobli E. A multihealth behavior intervention integrating physical activity and substance use prevention for adolescents. *Prev Sci.* 2005;6(3):213-226.

17. Werch CE, Bian H, Carlson JM, et al. Brief integrative multiple behavior intervention effects and mediators for adolescents. *J Behav Med.* 2011;34(1):3-12.

18. Perry CL, Komro KA, Veblen-Mortenson S, et al. A randomized controlled trial of the middle and junior high school D.A.R.E. and D.A.R.E. Plus programs. *Arch Pediatr Adolesc Med.* 2003;157(2):178-184.

19. Ellickson PL, McCaffrey DF, Ghosh-Dastidar B, Longshore DL. New inroads in preventing adolescent drug use: results from a large-scale trial of project ALERT in middle schools. *Am J Public Health.* 2003;93(11):1830-1836.

20. Mauriello LM, Driskell MM, Sherman KJ, Johnson SS, Prochaska JM, Prochaska JO. Acceptability of a school-based intervention for the prevention of adolescent obesity. *J Sch Nurs.* 2006;22(5):269-277.

21. Elliot DL, Goldberg L, Moe EL, et al. Long-term Outcomes of the ATHENA (Athletes Targeting Healthy Exercise & Nutrition Alternatives) Program for Female High School Athletes. *J Alcohol Drug Educ.* 2008;52(2):73-92.

22. Faggiano F, Richardson C, Bohrn K, Galanti MR, Group E-DS. A cluster randomized controlled trial of school-based prevention of tobacco, alcohol and drug use: the EU-Dap design and study population. *Prev Med.* 2007;44(2):170-173.

23. Faggiano F, Galanti MR, Bohrn K, et al. The effectiveness of a school-based substance abuse prevention program: EU-Dap cluster randomized controlled trial. *Prev Med.* 2008;47(5):537-543.

24. Lennox RD, Cecchini MA. The NARCONON drug education curriculum for high school students: a non-randomized, controlled prevention trial. *Subst Abuse Treat Prev Policy.* 2008;3:8.

25. Eisen M, Zellman GL, Murray DM. Evaluating the Lions-Quest "Skills for Adolescence" drug education program. Second-year behavior outcomes. *Addict Behav.* 2003;28(5):883-897.

26. Flay BR, Graumlich S, Segawa E, Burns JL, Holliday MY, Investigators AA. Effects of 2 prevention programs on high-risk behaviors among African American youth: a randomized trial. *Arch Pediatr Adolesc Med.* 2004;158(4):377-384.

27. Goldberg L, MacKinnon DP, Elliot DL, Moe EL, Clarke G, Cheong J. The adolescents training and learning to avoid steroids program: preventing drug use and promoting health behaviors. *Arch Pediatr Adolesc Med.* 2000;154(4):332-338.

28. Patton G, Bond L, Butler H, Glover S. Changing schools, changing health? Design and implementation of the Gatehouse Project. *J Adolesc Health.* 2003;33(4):231-239.

29. Prochaska JJ, Sallis JF. A randomized controlled trial of single versus multiple health behavior change: promoting physical activity and nutrition among adolescents. *Health Psychol.* 2004;23(3):314-318.

30. Kaplan CP, Zabkiewicz D, McPhee SJ, et al. Health-compromising behaviors among Vietnamese adolescents: the role of education and extracurricular activities. *J Adolesc Health.* 2003;32(5):374-383.

31. De la Haye K, D'Amico EJ, Miles JN, Ewing B, Tucker JS. Covariance among multiple health risk behaviors in adolescents. *PLoS One.* 2014;9(5):e98141.

32. Wada RK, Glaser DW, Bantum EO, et al. Hawai'i's multiethnic adolescent and young adult survivors of childhood cancer: are their health behavior risks similar to state and national samples? *Hawaii J Med Public Health.* 2013;72(11):380-385.

33. Peterson KE, Spadano-Gasbarro JL, Greaney ML, et al. Three-Year Improvements in Weight Status and Weight-Related Behaviors in Middle School Students: The Healthy Choices Study. *PLoS One.* 2015;10(8):e0134470.

34. Mauriello LM, Ciavatta MM, Paiva AL, et al. Results of a multi-media multiple behavior obesity prevention program for adolescents. *Prev Med.* 2010;51(6):451-456.

35. Gortmaker SL, Peterson K, Wiecha J, et al. Reducing obesity via a school-based interdisciplinary intervention among youth: Planet Health. *Arch Pediatr Adolesc Med.* 1999;153(4):409-418.

36. Haerens L, Deforche B, Maes L, Cardon G, Stevens V, De Bourdeaudhuij I. Evaluation of a 2-year physical activity and healthy eating intervention in middle school children. *Health Educ Res.* 2006;21(6):911-921.

37. Patton GC, Bond L, Carlin JB, et al. Promoting social inclusion in schools: a group-randomized trial of effects on student health risk behavior and well-being. *Am J Public Health.* 2006;96(9):1582-1587.

38. Komro KA, Perry CL, Veblen-Mortenson S, Williams CL. Peer participation in Project Northland: a community-wide alcohol use prevention project. *J Sch Health.* 1994;64(8):318-322.

39. Perry CL, Komro KA, Veblen-Mortenson S, et al. The Minnesota DARE PLUS Project: creating community partnerships to prevent drug use and violence. *J Sch Health.* 2000;70(3):84-88.

40. Stock S, Miranda C, Evans S, et al. Healthy Buddies: a novel, peer-led health promotion program for the prevention of obesity and eating disorders in children in elementary school. *Pediatrics.* 2007;120(4):e1059-1068.

41. Story M, Lytle LA, Birnbaum AS, Perry CL. Peer-led, school-based nutrition education for young adolescents: feasibility and process evaluation of the TEENS study. *J Sch Health.* 2002;72(3):121-127.

42. Gittelsohn J, Dennisuk LA, Christiansen K, et al. Development and implementation of Baltimore Healthy Eating Zones: a youth-targeted intervention to improve the urban food environment. *Health Educ Res.* 2013;28(4):732-744.

43. Bandura A. Health promotion by social cognitive means. *Health Educ Behav.* 2004;31(2):143-164.

Chapter 3: Use Of Peer Influence To Change Physical Activity And Fruit And Vegetable Social Cognitive And Behavior Variables In Filipino Adolescents.

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Abstract

In 2015, the majority of Filipino high school adolescents ate less than 5 fruit and vegetables (FV) per day or did not meet the recommended amount of physical activity (PA) per day in Hawai‘i. Physical inactive and low FV consumption during adolescence increases the likelihood of developing chronic diseases. This study aims to investigate the effectiveness of an adolescent peer-led health curriculum to change PA and FV consumption social cognitive and behavior variables in Filipino adolescents in Hawai‘i.

Methods: One hundred fourteen Filipino adolescents (86% female) from Waipahu High School (WHS) participated in the study. Health Capstone students were trained as peer educators (PEs) to deliver a health curriculum to underclass students (grades 9-11). Students in the study completed a questionnaire at baseline and follow-up.

Results: Multiple regression analysis showed follow-up PA knowledge for the intervention group is 0.62 units (SE=0.15, $p<0.01$) higher than the control group. Further regression showed follow-up Moderate-Vigorous PA (MPVA) for the intervention group is 20.04 min/week (SE=6.13, $p<0.01$) higher than the control group. There was a trend towards follow-up PA enjoyment for the intervention group being 0.41units (SE=0.23, $p=0.09$) higher than the control group. PA knowledge had a significant interaction for AT RISK (Stage of Change pre-contemplation, contemplation and preparation) ($F(1, 65)=6.69$, $p<0.01$).

Conclusion: Results suggest the peer-led HART curriculum has the potential to enhance PA knowledge, self-efficacy, enjoyment and MVPA. This is the first study to use PEs to change PA and FV consumption social cognitive and behavior variables in Filipino adolescents.

Introduction

In 2010, there were 3.4 million Filipinos (alone or in any combination) living in the United States (US), with ten percent of that ethnic population residing in the state of Hawai'i.[1,2] Filipinos are the third largest Asian subgroup in the US and 70% more likely to be obese compared to the overall Asian population.[3] Filipinos are also one of the most underrepresented populations in health research.[3,4] According to Joyce et al,[4] Filipino children have higher rates of being overweight and inactive when compared to other ethnicities of the same age. While adolescence is generally a healthy time of life, two important public health problems begin to emerge: lack of physical activity and poor nutrition habits.[5,6] Health behaviors established during this development period determine adolescents' current health status and risk for developing chronic diseases in adulthood.[5]

In 2015, among Filipino high school adolescents in Hawai'i, only 16% ate five or more fruit and vegetables (FV) per day compared to Caucasian (21%), Native Hawaiian (19%) and Other Pacific Islander (OPI) (23%).[7] Only 15% met the physical activity (PA) guideline of at least 60 minutes per day of moderate and vigorous PA compared to Caucasian (20%), Native Hawaiian (26%) and OPI (18%).[8] The combination of being physically inactive and having low FV consumption during adolescence increases the likelihood of developing chronic diseases.[9,10] With limited research targeting Filipinos, especially adolescents (age 10-19), and chronic diseases such as diabetes, cancer, heart disease, and obesity on the rise, a Filipino adolescent intervention study is warranted.[3,4]

Adolescents are highly influenced by their social environment: peers, family, school and community.[11,12] In traditional Filipino culture, an individual is seen as part of the family and community, and actions are taken for these groups rather than for individual gain.[13,14] Filipino

adolescents born in Hawai‘i may be more acculturated than first generation Filipinos.[12] Briefly, acculturation is the process of adopting cultural traits of another group that one is becoming a part of.[12] It can also be thought of as learning a second culture.[12] Thus, due to continuous contact with other ethnicities in Hawai‘i, second or third generation Filipino adolescents possibly may change their health behaviors.[12] American Filipino adolescent intervention programs need to be aware of both cultural values as well as acculturation of the population to counteract negative health behaviors.[12,15] The adolescent transitional period is a sensitive time, and it is important to address the positive development of health behaviors to ensure a healthy, productive adult population.[6,15]

One approach to changing adolescent health behaviors involves peer-led initiatives. Peer educators (PEs) can be positive role models who directly affect their social environment to help change health behaviors.[16] Studies using PE initiatives have shown PEs can improve self-efficacy, knowledge, attitudes and behaviors.[16] However, no studies were identified that used PEs with a focus on changing Filipino adolescent PA and FV consumption social cognitive and behavior variables.

With Filipino adolescents being one of the most overweight ethnicity groups in Hawai‘i, it is important to have research that focuses on decreasing health disparities in this population.[16] Theory-based interventions are an effective way to create health behavior change. The Social Cognitive Theory (SCT) is one of the most utilized theories in health behavior research that focuses on both predictors and principles to enable, guide and motivate people to adopt and promote health behaviors.[17] The premise of the SCT is that behavior change is made possible by a personal sense of control.[17] SCT focuses on three mutually interacting factors that create this sense of control thus behavior change: cognitive, behavioral, and environmental.[17] Utilizing the

SCT, this study aims to investigate the effectiveness of an adolescent peer-to-peer health behavior curriculum to change PA and FV consumption social cognitive and behavior variables in Filipino adolescents in Hawai‘i. We believe underclass students participating in HART curriculum will increase their PA and FV consumption social cognitive and behavior variables compared to a control group.

Methods

This study is the intervention component of the Waipahu Health Action Research and Training (HART) project for the school year of 2014-2015. The Waipahu HART project aims to promote PA and healthy nutrition in a classroom-based setting, using senior students' positive influence, as PEs, on underclass students to change health behaviors. Waipahu HART is a partnership between Waipahu High School (WHS), Hawai‘i Department of Education (DOE), and University of Hawai‘i Department of Public Health Sciences in Honolulu, Hawai‘i. The University of Hawai‘i IRB and Hawai‘i DOE approved all methods and procedures for the HART study.

HART Curriculum Description

Each group of seniors (PEs) was provided two curriculum-training folders, one for the fall lessons and one for the spring lessons. Each folder contained all lessons that were to be taught. Within each lesson, there were three main items: an outline of the lesson; a script of the entire lesson; and, specific worksheets and handouts for the lesson. The outline of each lesson included a warm-up, activities, and a cool down. The warm-up for each week was delivered through an icebreaker game and a discussion of the previous week's activities. The activities for each group varied depending on the topic to be covered on PA and nutrition. The activities were informed by pilot work[19] and the SCT. The activities addressed knowledge, individual

motivational factors, skills and the environment. The cool down for each week included explanations of the homework for the next week. Take home assignments were given for each lesson to encourage and foster the information the students were taught. The topics of the curriculum are highlighted below.

The 8 lesson topics and related homework of the HART curriculum are:

1. Introduction to Nutrition and Physical Activity
    a. Homework: Nutrition and Physical Activity Pamphlet
2. The Ingredients of Nutrition and Physical Activity
    a. Homework: Reading Food Labels and incorporating Frequency, Intensity, Time and Type (FITT) into daily physical activity
3. Eating the Rainbow and Variety in Physical Activity
    a. Homework: Influencing Family Shopping & Try a New Activity
4. Eating Out and Working Out
    a. Homework: Staying healthy over the Holidays
5. Refresher on Carbohydrates, Fats, and Proteins and Different Forms of Physical Activity
    a. Homework: Using Food Labels to make healthy choices and searching the web to find an aerobic activity to try. Creating a poster for display at school.
6. Small Changes
    a. Homework: Find a healthier version of favorite food to make and searching the web to find a strength-based workout to try.
7. Gathering Social Support to Ensure Success

a. Homework: Group members encourage each other to increase fruit/vegetable consumption and search the web to find a flexibility and balance workout to try.

8. Positive Attitude for a Positive Life
    a. Homework: Be healthy and make healthy choices

The Waipahu HART curriculum has been tailored to address cultural norms of Filipino adolescents in Waipahu, Hawai‘i. Between 2010 to 2013, WHS students helped develop and amend the HART curriculum, while piloting the study. Next, local Filipino adolescents, interning with the Waipahu HART research staff, helped develop the activities for all eight lessons, found videos to match each lesson, and edited the lessons on PA and nutrition, so they reflected the interests of Filipino adolescents. Also, senior HART educators used their examples for PA and food choices in each lesson. Lastly, students participating in the intervention shared their ideas for PA and healthy food choices.

Five classes from three health teachers participated in the HART curriculum (n=70). For comparison purposes, four classes participated in measurement only serving as the control group (n=44). Only students who were Filipino, returned parental consent and signed student assent forms were included in the study. The classroom teacher provided students who wished not to participate in the questionnaire a supplemental classroom activity during that time.

Measures

Social Cognitive

Nutrition Knowledge questions were created based on information gathered in the initial development of the Waipahu HART project and created to reflect the HART curriculum.[18] Four true/false questions were used to address food groups, label reading, FV, and recommendations.

Questions answered correctly were summed to obtain a score. Face validity, the extent which a test is subjectively viewed as covering the concept it purports to measure,[19] was confirmed via a Ph.D. and a Master level judge who developed and were familiar with the HART curriculum. The items were specifically evaluated in terms of representing the content of the HART topics.

PA Knowledge items were generated specifically for the content of the Waipahu HART curriculum based on initial development the Waipahu HART project.[18] Four true/false questions were used to address intensities, PA types, energy balance, and recommendations. Questions answered correctly were summed to obtain a score. Face validity, the extent which a test is subjectively viewed as covering the concept it purports to measure,[19] was confirmed via a Ph.D. and a Master level judge who developed and were familiar with the HART curriculum. The items were specifically evaluated in terms of representing the content of the HART topics.

PA Stages of Change used one question to assess an individual's readiness to participate in regular PA. Individuals were asked about participating in sixty minutes per day of moderate to vigorous PA at least five days or more a week, with the activity making the heart beat faster or breathing harder. Answers were classified as precontemplation, contemplation, preparation, action, or maintenance based on the stages of the Transtheoretical Model (TTM).[20] The TTM has parallels to the SCT (self-efficacy and enjoyment) but goes beyond only behavior to help understand the change process. Students were classified as 1) precontemplation if they do not plan to start doing regular PA in the next six months, 2) contemplation if they do not do regular PA, but plan to start doing regular PA in the next six months, 3) preparation if they do not do regular PA but plan to start doing regular PA in the next thirty days, 4) action if they have been doing regular PA but for less than six months, and 5) maintenance if they have done so for more than six months, respectively.[21] PA stages of change has shown to be valid in adolescents.[22]

FV Stages of Change used one question to assess an individual's readiness to consume four and a half cups or more of FV each day (one cup = one small apple = one baseball = one tennis ball). Answers were classified as precontemplation, contemplation, preparation, action, or maintenance based on the stages of TTM.[20] Students were classified as 1) precontemplation if they do not eat four and a half cups or more of FV a day and do not intend to start in the next six months, 2) contemplation if they do not eat four and a half cups or more of FV a day but do intend to start in the next six months, 3) preparation if they do not eat four and a half cups or more of FV a day but intend to start in the next thirty days, 4) action if they do eat four and a half cups or more of FV a day and have done so for less than six months, and 5) maintenance if they have done so for more than six months, respectively.[23] Validity and reliability of this scale has been shown in African-American adolescents.[24]

FV Self-Efficacy was measured using six questions asking, "How CONFIDENT are you that you would be able to eat vegetables and fruits when: 1) eating at a restaurant; 2) hands and fingers hurt when have to cut or peel them; 3) it's hard to get to store to buy; 4) had a hard day and not feeling good; 5) cooking vegetables is difficult to do; and, 6) fruit and vegetables don't taste good to you"? The answers to the six questions are on a 5-point Likert-type scale with 1 (not at all confident), 2 (not very confident), 3 (moderately confident), 4 (very confident) 5 (completely confident). The mean of the items was used. A previous study has shown the FV self-efficacy scale to be reliable and valid in adolescents.[25]

PA Self-Efficacy measured confidence to do PA when one of six specific barriers existed: 1) when it is raining, snowy or icy; 2) under a lot of stress; 3) when I don't have the time; 4) when I have to exercise alone; 5) don't have access to a place to exercise; and, 6) when I am spending time with friends. The answers to the six questions used a 5-point Likert-type scale

with 1 (not at all sure), 2 (somewhat sure), 3 (moderately sure), 4 (very sure) 5 (completely sure). The mean of all items was used. The PA self-efficacy scale adequately fit data for a large random sample of people living in Hawai‘i.[26] Also, factorial invariance of the PA self-efficacy scale was documented across age, gender, group and ethnicity.[26] Internally consistent of this scale for adults living in Hawai‘i was 0.85.[26]

PA Enjoyment described how participants feel about being active.[27] The variable is composed of five questions (I enjoy it, my body feels good, I get something good out of it, it's very exciting, and it feels good) using a 5-point Likert-type scale from 1 (disagree a lot), 2 (disagree a little), 3 (neutral), 4 (agree a little), and 5 (agree a lot). The mean of the items was used. This scale has been found to be a valid and reliable measure of PA enjoyment in children with asthma.[28]

Behaviors

Physical Activity was assessed using an adapted Leisure-Time Physical Activity Questionnaire created by Godin and Shephard.[29] Students reported the number of days in a week they performed strenuous, moderate, and mild PA. Strenuous activity is any activity that makes the heart beat quickly and sweats. An activity that makes one tired and sweats a little is moderate activity. While mild activity is any activity that takes little effort and does not make one sweat. In addition to frequency, students answered questions regarding duration – on average how many minutes (0, 10, 20, 30, 40, 50, and 60+) a day they spent doing a strenuous, moderate, and mild activity. Sallis et al[30] showed this variable is reliable and valid in children and adolescents.

FV Consumption was assessed using three items from the Youth Risk Behavior Surveillance System (YRBSS) survey to prompt how often in the past seven days the participant consumed 100% fruit juices (not including punch, sports drinks, or fruit-flavored drinks), fruits,

and vegetables.[31] Response options include: never during the last week; 1 to 3 times per week; 4 to 6 times per week; 1 time per day; 2 times per day; 3 times per day; and, 4 or more times per day. These were recoded to reflect total consumption per a day. The YRBSS has been shown to be a valid tool in adolescents when compared with 24-hour dietary recall for frequency of fruit juice, fruit and vegetable consumption.[32]

These measures were used to assess the effectiveness of the implementation of the HART curriculum on underclass students. They were collected at baseline (November 2014) and follow-up (March 2015) of the project. A control group took the same questionnaire at the same time as the HART curriculum group.

Data Analysis

Demographics and study variables descriptive were calculated. Two multiple regressions were performed on changes in any measure's score. The first regression controlled for baseline score to ensure the group differences is what was affecting post score. The second regression was run controlling for baseline score, gender, and age and to further understand what, if anything, affected follow-up scores.

A 2x2 (time x group) repeated measures ANOVA was also used to examine change in PA and FV variable scores for those adolescents who were considered AT RISK or did not meet the action criteria (recommended guidelines) for PA or FV consumption. This additional analysis was conducted with those adolescents in the *pre-action (pre-contemplation, contemplation, preparation) PA Stages of Change* and for those in the *pre-action Stages of Change for FV consumption (pre-contemplation, contemplation, preparation)* in both groups. Stage of Change was used as criteria since it was the student's judgment of meeting recommended guidelines. All

data analysis was conducted via SPSS 22.0 (SPSS Worldwide Headquarters, Chicago, IL). Significance was set *a priori* at <0.05.

Results

Table 3.1 shows the distribution of adolescent participants by gender, case (intervention control, AT RISK PA and AT RISK FV consumption). A total of 114 adolescents (86% female) participated in the HART questionnaire. Descriptive statistics for PA and FV consumption variables are provided in Tables 3.2 and 3.3, respectively.

PA Multiple Regression

Table 3.4 shows the main effects for the relationship between PA follow-up variable scores and group while controlling for PA baseline variable score. As can be seen in Table 3.4, the multiple regression models for PA with 2 predictors produced R^2 of; PA knowledge 0.17, stage of change 0.33, self-efficacy 0.28, enjoyment 0.21 and MVPA 0.42. Each of the PA variables had significant positive regression weight (p<0.01). Baseline PA knowledge was associated with higher follow-up PA knowledge ($\hat{\beta}$=0.22, SE=0.09, p=.02) and the follow-up PA knowledge for the intervention group is 0.62 units (SE=0.15, p<0.01) higher than the control group. Baseline PA stage of change ($\hat{\beta}$=0.62, SE=0.10, p<0.01), self-efficacy ($\hat{\beta}$=0.50, SE=0.09, p<0.01), enjoyment ($\hat{\beta}$=0.56, SE=0.11, p<0.01) and MVPA ($\hat{\beta}$=0.67, SE=0.09, p<0.01) were associated with higher follow-up scores. There was a trend toward follow-up PA self-efficacy for the intervention group being 0.25 units (SE=0.13, p=0.06) higher than the control group.

Further regression of the relationship between follow-up PA variable scores and group while controlling for baseline score, age, and sex are shown in Table 3.5. The multiple regression models for PA with 4 predictors produced R^2 of; PA knowledge 0.20, stage of change 0.36, self-efficacy 0.27, enjoyment 0.22 and MVPA 0.49. Each of the PA variables had significant positive

regression weight (p<0.01). Baseline PA knowledge was associated with higher follow-up PA knowledge ($\hat{\beta}$=0.22, SE=0.09, p=0.02) and the follow-up PA knowledge for the intervention group is 0.95 units (SE=0.24, p<0.01) higher than the control group. Baseline PA stage of change ($\hat{\beta}$=0.63, SE=0.10, p<0.01), self-efficacy ($\hat{\beta}$=0.49, SE=0.09, p<0.01), enjoyment ($\hat{\beta}$=0.55, SE=0.11, p<0.01), and MVPA ($\hat{\beta}$=0.67, SE=0.08, p<0.01) were associated with higher follow-up scores. There was a trend towards follow-up PA enjoyment for the intervention group being 0.41units (SE=0.23, p=0.09) higher than the control group. Follow-up MVPA for the intervention group is 20.04 min/week (SE= 6.13, p<0.01) higher than the control group. Sex was associated with higher follow-up stage of change ($\hat{\beta}$=0.59, SE=0.59, p=0.03) Age was associated with higher follow-up MVPA ($\hat{\beta}$=7.13, SE=2.34, p<0.01).

FV Multiple Regression

Table 3.6 shows the main effects for the relationship between FV follow-up variable scores and group. The multiple regression models for FV with 2 predictors produced R^2 of; FV knowledge 0.03, stage of change 0.26, self-efficacy 0.11 and consumption 0.15. Only the FV stage of change, self-efficacy and consumption variables had significant positive regression weight (p<0.01). Baseline FV stage of change ($\hat{\beta}$=0.54, SE=0.50, p<0.01), self-efficacy ($\hat{\beta}$=0.34, SE=0.31, p<0.01), and FV consumption ($\hat{\beta}$=0.39, SE=0.36, p<0.01) were associated with higher FV follow-up scores. There was a trend towards follow-up FV stage of change for the intervention group being 0.10 units (SE=0.05, p=0.06) higher than the control group. Nutrition knowledge follow-up was not associated with group or baseline nutrition knowledge score. Multiple regression analysis showing main effects for the relationship between FV follow-up variables score and group while controlling for baseline score, age and sex are presented in table 3.7. The multiple regression models for PA with 4 predictors produced R^2 of; FV knowledge

0.02, stage of change 0.26, self-efficacy 0.12 and consumption 0.16. Only FV stage of change, self-efficacy and consumption variables had significant positive regression weight ($p<0.01$). Baseline FV stage of change ($\hat{\beta}=0.53$, SE=0.10, $p<0.01$), self-efficacy ($\hat{\beta}=0.34$, SE=0.34, $p<0.01$), and FV consumption ($\hat{\beta}=0.40$, SE=0.10, $p<0.01$) were associated with higher FV follow-up scores.

AT RISK PA

Descriptive statistics with results for AT RISK PA variables are provided in Table 3.8. There was a significant interaction found for AT RISK PA knowledge ($F(1, 65)=6.69$, $p<0.01$, $\eta^2=0.09$) between the intervention (M=2.89(0.86) to 3.39(0.72)) and control (M=3.03(0.82) to 2.93(0.80)) group over time. There was no significant interaction found over time for AT RISK PA stage of change ($F(1, 67)=0.66$, $p=0.42$, $\eta^2=0.01$), self-efficacy ($F(1, 65)=0.56$, $p=0.45$, $\eta^2=0.01$), enjoyment ($F(1, 66)=0.67$, $p=0.41$, $\eta^2=0.01$), or MVPA ($F(1, 66)=0.23$, $p=0.63$, $\eta^2=0.00$).

AT RISK FV

Descriptive statistics with results for AT RISK FV variables are provided in Table 3.9. There was no significant interaction found for AT RISK FV variables nutrition knowledge ($F(1, 63)=0.11$, $p=0.74$, $\eta^2=0.00$), stage of change ($F(1, 62)=0.10$, $p=0.75$, $\eta^2=0.00$), self-efficacy ($F(1, 61)=1.55$, $p=0.22$, $\eta^2=0.02$), or consumption ($F(1, 63)=0.07$, $p=0.79$, $\eta^2=0.00$).

Discussion

The purpose of this study was to see if a peer-led PA and nutrition curriculum could positively change PA and FV social cognitive and behavior variables in Filipino adolescents. The regression analysis showed indication of a positive impact on group differences for PA self-efficacy, enjoyment, and MVPA. Other studies, in the same age population, have found

significant effects for increased self-efficacy,[33,34] MVPA[35,36] and enjoyment associated with PA[37-39] in school-based interventions. The results of this study suggest that the peer-led HART curriculum has the potential to enhance PA knowledge, self-efficacy, enjoyment and MVPA. These effects may be because activities in the HART curriculum introduced students to different ways to be PA, encouraged them to do PA they enjoy, taught them how to overcome challenges of being PA and because students worked as a team to encourage PA.

The peer-led HART curriculum also had a significant interaction for PA knowledge on the AT RISK group. Other studies have had similar results for PA knowledge increasing over time through curriculum delivered intervention in children.[33,40] It should be noted group differences only had a small effect on PA knowledge over time. The PA AT RISK analysis is unique in that it looks only at students who are not meeting recommendations. This analysis provides evidence that peer-led health curriculums can increase PA knowledge. The PA knowledge for AT RISK students may have had more of an effect due to information being new and delivered by their peers. Further research should be on done on how peer-led health curriculums affect adolescents considered AT RISK for health behaviors.

The peer-led HART curriculum had no effect on FV consumption social cognitive and behavior variables. These findings are similar to a peer-led obesity prevention program in schools in England.[41] Bell et al[41] believed delivering two health messages simultaneously might have been too complex for adolescent PEs. Having adolescent PEs focus on one health behavior at a time could result in improved delivery of material and avoid diffusing health behavior messages. Also, the information being delivered in the HART curriculum is delivered as part of the regular curriculum in both groups' (intervention and control) health classes. This possibly explains the lack of interaction found between groups.

Future approaches to the HART curriculum should focus on ways to better measure and continue to increase PA and FV consumption social cognitive and behavioral variables. One approach is the addition of a scale examining broader enjoyment of PA in Filipino adolescents. Motl et al[42] included a 12-item measure of factors influencing enjoyment of physical education on measuring enjoyment of PA in adolescent girls to examine the construct validity of the Physical Activity Enjoyment Scale (PACES) in a curriculum-relevant context. This could be a useful tool in gaining an understanding of how to increase PA enjoyment through the HART curriculum.

PA and FV consumption knowledge questions were developed for the HART questionnaire based on pilot work by Geller et al[18] The mean score for both groups was considerably high for these questions. Additional questions that reflect lessons from the HART curriculum could be added to ensure students are increasing their knowledge. Consideration needs to be taken, though, on how these additional measures will affect the response burden on students.

Another approach would be to determine the extent Filipino adolescents, in different stages of PA, differ in perceived benefits of and barriers to PA. Findings could help with tailoring the HART curriculum to ensure progress through PA stage of change for Filipino adolescents, especially those that fall in the pre-contemplation and contemplation (AT-RISK) stage. Taymoori and Berry[43] used this approach to examine longitudinal changes in beliefs, by stage of change, in PA adoption in Iranian girls. The addition of new elements (i.e. culinary classes on cutting and cooking with FV) to the HART curriculum could aid in increasing FV consumption social cognitive variables. A pilot study in Latino adolescents using culinary education as part of their intervention showed improved FV social cognitive variables compared

to the control group.[44] Lastly, the current HART curriculum needs to be disseminated in both non-health curriculum and health core classes. Results could give insight into the effectiveness of the peer-led HART curriculum outside of health core classes.

The addition of objective measures for PA and FV consumption should also be considered. The use of accelerometers would give a better indication of intensity, frequency, duration, as well as energy expenditure for PA. It would allow for more confidence in the effects of the PA portion of the curriculum on students beyond self-report. A less expensive PA measure would be the addition of four field test items that cover types of PA taught in lesson 1, aerobic (Cooper's 12-minute run), muscular strength (push-up test), balance (Berg Balance Scale), and flexibility (sit and reach test). This would give an assessment of the students' all around fitness, while also allowing for the incorporation of a hands-on PA lesson for the students that incorporates information already being taught and promoted throughout all eight lessons.

For FV consumption, the incorporation of the food diaries from the homework for lesson 5 could be used to assess quantitative and qualitative food consumption of the students. The diaries only capture a weekday and a weekend but could be added during lesson 1-4, lesson 5-8, and possibly a third time after the intervention has completed, to giving more information on the long-term effect of the HART curriculum on Filipino adolescents nutrition behavior change. Consideration needs to be taken though on the cost of training researchers to evaluate food diaries and time needed for data entry.

Future policy for Hawai‘i DOE should add more PA components into health curricula beyond the Physical Education class students receive. The Hawai‘i DOE requires high school students to take 1.0 credit of physical education before graduation and gives daily 20-minute recess breaks during which students are encouraged to be moderate to vigorously active.[45] With

only 20% of Hawai‘i public high school students meeting PA guidelines,[8] and 28% not having a healthy body weight,[46] a better policy should be implemented to help create and foster behavior change. The addition of required credits for PE, or strengthening the PA portion in health courses, could lead to greater change in PA in Hawai‘i public high school students and aid in the prevention of chronic disease into adulthood.

It should be noted there are several limitations to this study. First, the study design is quasi-experimental as the researchers were not able to randomly assign classes to the intervention and control groups. The teachers who volunteered to have their classes be a part of the study all taught health curriculum classes. This could explain the lack of significance for interactions in many of the variables. Also, the questionnaire is self-report, which could have led to reporting bias based on social norms by participants. Another limitation is the buy-in from the PEs teaching the curriculum. Their enthusiasm and ability to effectively deliver the lesson could influence the intervention participants' willingness to learn and engage. Future studies should investigate the PEs role in motivating students to be more PA and consume more FV. Lastly, this study is focused on Filipino adolescents, which limits its generalizability. Notwithstanding these limitations, this is one of the first studies to analyze longitudinally a peer-led PA and nutrition curriculum on increasing social cognitive and behavior changes in Filipino adolescents. It is also the first study to analyze Filipino adolescents considered AT RISK for PA and shows promise that a peer-led PA and nutrition curriculum is beneficial to Filipino adolescents.

Conclusion

In conclusion, there has been limited research investigating if PA and FV consumption social cognitive and behaviors can be changed through a peer-led curriculum in adolescent Filipinos.[1-4] While this study only had a significant interaction for PA knowledge, further

investigation is warranted. This is the first analysis of the Waipahu HART intervention, which is still in the pilot phase. Researchers now have valuable information they can use to update the HART curriculum and questionnaire to better reflect Filipino adolescents, work on strengthening its delivery through PEs, and involving more classes at WHS.

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References

1. Equity OoMHaH. Center for Disease Control- Asian American Populations. 2013; http://www.cdc.gov/minorityhealth/populations/REMP/asian.html. Accessed January 25, 2016.

2. The Asian Population: 2010. United States Department of Commerce Economics and Statistics Administration; 2010. https://www.census.gov/newsroom/releases/archives/2010_census/cb12-cn22.html.

3. Obesity and Asian Americans. 2015; http://minorityhealth.hhs.gov/omh/browse.aspx?lvl=4&lvlID=55. Accessed May 2016.

4. Joyce J, Lynne H, Fernando M. Filipino Child Health in the United States: Do Health and Health Care Disparities Exist? *Preventing Chronic Disease.* 2007;4(2):20. https://www.cdc.gov/pcd/issues/2007/apr/06_0069.htm.

5. Mulye TP, Park MJ, Nelson CD, Adams SH, Irwin CE, Brindis CD. Trends in adolescent and young adult health in the United States. *J Adolesc Health.* 2009;45(1):8-24.

6. Nelson MC, Gordon-Larsen P. Physical activity and sedentary behavior patterns are associated with selected adolescent health risk behaviors. *Pediatrics.* 2006;117(4):1281-1290.

7. PAN Plan Target Teen Fruit and Vegetable Consumption. 2015; http://www.hawaiihealthmatters.org/modules.php?op=modload&name=NS-Indicator&file=indicator&indid=3000263000407&iid=11662171, 2016.

8. Teens Who Meet Aerobic Physical Activity Guidelines 2015. 2015; http://www.hawaiihealthmatters.org/modules.php?op=modload&name=NS-Indicator&file=indicator&indid=3000523000407&iid=11651993, 2016.

9. Lowry R, Michael S, Demissie Z, Kann L, Galuska DA. Associations of Physical Activity and Sedentary Behaviors with Dietary Behaviors among US High School Students. *J Obes.* 2015;2015:876524.

10. Prochaska JJ, Sallis JF. A randomized controlled trial of single versus multiple health behavior change: promoting physical activity and nutrition among adolescents. *Health Psychol.* 2004;23(3):314-318.

11. Yang F, Tan KA, Cheng WJ. The effects of connectedness on health-promoting and health-compromising behaviors in adolescents: evidence from a statewide survey. *J Prim Prev.* 2014;35(1):33-46.

12. Chakraborty BM, Chakraborty R. Concept, measurement and use of acculturation in health and disease risk studies. *Coll Antropol.* 2010;34(4):1179-1191.

13. Watkins D, Gerong A. Culture and spontaneous self-concept among Filipino college students. *J Soc Psychol.* 1997;137(4):480-488.

14. Pe-Pua R, Protacio-Marcelino E. Sikolohiyang Pilipino (Filipino psychology): A legacy of Virgilio G. Enriquez. *Asian Journal of Social Psychology.* 2000;3:49 - 71.

15. Grunbaum JA, Lowry R, Kann L, Pateman B. Prevalence of health risk behaviors among Asian American/Pacific Islander high school students. *J Adolesc Health.* 2000;27(5):322-330.

16. Community Dashboard: Teens who are Overweight. 2015; Hawaii by Race/Ethnicity for Health Behaviors. Available at: http://www.hawaiihealthmatters.org/modules.php?op=modload&name=NS-Indicator&file=indicator&iid=11662182&Submit=Go, 2016.

17. Bandura A. Health promotion by social cognitive means. *Health Educ Behav.* 2004;31(2):143-164.

18. Geller K, Alvarez A, Nigg C, Okay A, Timbobolan J. Parent and Friend Influences on the Multiple Health Behaviors of Adolescents in Hawai'i. *California Journal of Health Promotion.* 2014;12(2):55-68.

19. Greco L, Walop W, McCarthy R. Questionnaire development: 2. Validity and reliability. *Clinical Epidemiology.* 1987;136:699-700.

20. Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. *Am J Health Promot.* 1997;12(1):38-48.

21. Schumann A, Nigg CR, Rossi JS, et al. Construct validity of the stages of change of exercise adoption for different intensities of physical activity in four samples of differing age groups. *Am J Health Promot.* 2002;16(5):280-287.

22. Parker PD, Martin AJ, Martinez C, Marsh HW, Jackson SA. Stages of change in physical activity: A validation study in late adolescence. *Health Educ Behav.* 2010;37(3):318-329.

23. Greene GW, Fey-Yensan N, Padula C, Rossi S, Rossi JS, Clark PG. Differences in psychosocial variables by stage of change for fruits and vegetables in older adults. *J Am Diet Assoc.* 2004;104(8):1236-1243.

24. Di Noia J, Mauriello L, Byrd-Bredbenner C, Thompson D. Validity and reliability of a dietary stages of change measure among economically disadvantaged African-American adolescents. *Am J Health Promot.* 2012;26(6):381-389.

25. Hagler AS, Norman GJ, Radick LR, Calfas KJ, Sallis JF. Comparability and reliability of paper- and computer-based measures of psychosocial constructs for adolescent fruit and vegetable and dietary fat intake. *J Am Diet Assoc.* 2005;105(11):1758-1764.

26. Paxton RJ, Nigg CR, Motl RW, et al. Are constructs of the transtheoretical model for physical activity measured equivalently between sexes, age groups, and ethnicities? *Ann Behav Med.* 2008;35(3):308-318.

27. Paxton RJ, Nigg C, Motl RW, et al. Physical Activity Enjoyment Scale short form--does it fit for children? *Res Q Exerc Sport.* 2008;79(3):423-427.

28. Latorre Román P, García Pinillos F, Navarro Martínez AV, Izquierdo Rus T. Validity and reliability of Physical Activity Enjoyment Scale questionnaire (PACES) in children with asthma. *J Asthma.* 2014;51(6):633-638.

29. Godin G, Shephard RJ. A simple method to assess exercise behavior in the community. *Can J Appl Sport Sci.* 1985;10(3):141-146.

30. Sallis JF, Buono MJ, Roby JJ, Micale FG, Nelson JA. Seven-day recall and other physical activity self-reports in children and adolescents. *Med Sci Sports Exerc.* 1993;25(1):99-108.

31. Youth Risk Behavior Surveillance System. http://www.cdc.gov/healthyyouth/data/yrbs/index.htm. Accessed February 21, 2016.

32. Eaton D, Olsen E, Brener N, et al. A comparison of fruit and vegetable intake estimates from three survey question sets to estimates from 24-hour dietary recall interviews. *J Acad Nutr Diet.* 2013:113(9):1165-1174.

33. Santos RG, Durksen A, Rabbanni R, et al. Effectiveness of peer-based healthy living lesson plans on anthropometric measures and physical activity in elementary school students: a cluster randomized trial. *JAMA Pediatr.* 2014;168(4):330-337.

34. Saksvig BI, Gittelsohn J, Harris SB, Hanley AJ, Valente TW, Zinman B. A pilot school-based healthy eating and physical activity intervention improves diet, food knowledge, and self-efficacy for native Canadian children. *J Nutr.* 2005;135(10):2392-2398.

35. Haerens L, Deforche B, Maes L, Cardon G, Stevens V, De Bourdeaudhuij I. Evaluation of a 2-year physical activity and healthy eating intervention in middle school children. *Health Educ Res.* 2006;21(6):911-921.

36. Wilson DK, Evans AE, Williams J, Mixon G, Sirard JR, Pate R. A preliminary test of a student-centered intervention on increasing physical activity in underserved adolescents. *Ann Behav Med.* 2005;30(2):119-124.

37. Sallis JF, Prochaska JJ, Taylor WC, Hill JO, Geraci JC. Correlates of physical activity in a national sample of girls and boys in grades 4 through 12. *Health Psychol.* 1999;18(4):410-415.

38. Trost SG, Pate RR, Saunders R, Ward DS, Dowda M, Felton G. A prospective study of the determinants of physical activity in rural fifth-grade children. *Prev Med.* 1997;26(2):257-263.

39. DiLorenzo TM, Stucky-Ropp RC, Vander Wal JS, Gotham HJ. Determinants of exercise among children. II. A longitudinal analysis. *Prev Med.* 1998;27(3):470-477.

40. Nichols S, Francis M, Dalrymple N. Sustainability of a Curriculum-based Intervention on Dietary Behaviors and Physical Activity among Primary School Children in Trinidad and Tobago. *West Indian Medical Journal.* 2014;63(1):68-77.

41. Bell S, Audrey S, Cooper A, Noble S, Campbell R. Lessons from a peer-led obesity prevention program in English schools. *Health Promotion International.* 2014:1-11.

42. Motl RW, Dishman RK, Saunders R, Dowda M, Felton G, Pate RR. Measuring enjoyment of physical activity in adolescent girls. *Am J Prev Med.* 2001;21(2):110-117.

43. Taymoori P, Berry TR. Longitudinal changes in beliefs by stage of physical activity adoption in Iranian girls. *J Sch Health.* 2015;85(5):299-308.

44. Gatto NM, Ventura EE, Cook LT, Gyllenhammer LE, Davis JN. LA Sprouts: a garden-based nutrition intervention pilot program influences motivation and preferences for fruits and vegetables in Latino youth. *J Acad Nutr Diet.* 2012;112(6):913-920.

45. Hawaii DOE Physical Education & Activity Guidelines. 2016; http://www.hawaiipublicschools.org/TeachingAndLearning/HealthAndNutrition/WellnessGuidelines/Pages/PAS.aspx. Accessed October 6, 2016.

46. Hawaii Health Matters: Teens with a Healthy Body Weight. 2016; http://www.hawaiihealthmatters.org/index.php?module=indicators&controller=index&action=view&indicatorId=1321&localeId=14. Accessed October 6, 2016.

Table 3.1: Descriptive statistics of Filipino adolescents

		N	Percent
Filipino		**114**	
Sex			
	Male	**16**	**14**
	Female	**98**	**86**
Case			
	Intervention	**70**	**61.4**
	Control	**44**	**38.6**
	Total	**114**	**100**
AT RISK PA			
	PA Intervention	**41**	**56.2**
	PA Control	**32**	**43.8**
	Total	**73**	**100**
AT RISK FV			
	FV Intervention	**41**	**56.9**
	FV Control	**31**	**43.1**
	Total	**72**	**100**

Table 3.2: Descriptive statistics for PA variables

PA Variables	Group	N	Baseline Mean (SD)	Follow-up Mean (SD)
PA Knowledge	**Intervention**	**60**	**2.85 (0.80)**	**3.38 (0.71)**
	Control	**40**	**3.03 (0.80)**	**2.80 (0.82)**
	Total	**100**		
PA stage of change	**Intervention**	**60**	**3.37 (0.92)**	**3.58 (1.09)**
	Control	**41**	**2.90 (1.02)**	**3.05 (1.12)**
	Total	**101**		
PA Self-Efficacy	**Intervention**	**60**	**2.87 (0.71)**	**3.15 (0.70)**
	Control	**39**	**2.70 (0.68)**	**2.82 (0.74)**
	Total	**99**		
PA Enjoyment	**Intervention**	**61**	**4.13 (0.60)**	**4.27 (0.70)**
	Control	**40**	**4.14 (0.67)**	**4.11 (0.91)**
	Total	**101**		
MVPA min/day	**Intervention**	**60**	**30.71 (23.13)**	**33.90 (27.06)**
	Control	**40**	**21.64 (21.14)**	**21.21 (18.95)**
	Total	**100**		

Table 3.3: Descriptive statistics for FV variables

FV Variables	Group	N	Baseline Mean (SD)	Follow-up Mean (SD)
Nutrition Knowledge	Intervention	60	3.65 (0.55)	3.77 (0.43)
	Control	41	3.60 (0.63)	3.80 (0.46)
	Total	101		
FV Stage of Change	Intervention	61	3.39 (1.04)	3.57 (1.02)
	Control	40	3.07 (0.94)	3.30 (1.16)
	Total	101		
FV Self-Efficacy	Intervention	59	3.15 (0.69)	3.13 (0.68)
	Control	40	2.75 (0.59)	2.90 (0.78)
	Total	99		
FV Consumption	Intervention	61	2.86 (2.31)	3.43 (2.55)
	Control	41	2.06 (2.04)	2.49 (2.10)
	Total	102		

Table 3.4: Multiple Regression of PA variables controlling for baseline PA score and group

Dependent Variable	Control Variable	F (df)	R2	Sig.	$\widehat{\beta}$	SE	t	Sig.
PA Knowledge		10.08 (2, 99)	0.17	0.00*				
	PA Knowledge Baseline				0.22	0.09	2.32	0.02*
	Group				0.62	0.15	4.07	0.00*
PA Stage of Change		23.80 (2, 100)	0.33	0.00*				
	PA Stage of Change Baseline				0.62	0.10	6.30	0.00*
	Group				0.24	0.19	1.27	0.20
PA Self-efficacy		18.51 (2, 98)	0.28	0.00*				
	PA Self-efficacy Baseline				0.50	0.09	5.34	0.00*
	Group				0.25	0.13	1.89	0.06
PA Enjoyment		13.15 (2, 100)	0.21	0.00*				
	PA Enjoyment Baseline				0.56	0.11	4.99	0.00*
	Group				0.17	0.14	1.19	0.24
MVPA		36.40 (2, 99)	0.43	0.00*				
	MVPA Baseline				0.67	0.09	7.88	0.00*
	Group				6.57	3.95	1.66	0.10

*** Statistically significant, $p<0.05$. SE = Standard Error**

Table 3.5: Multiple Regression of PA variables

Dependent Variable	Control Variable	F (df)	R^2	Sig.	$\widehat{\beta}$	SE	t	Sig.
PA Knowledge		**5.82 (4, 99)**	**0.20**	**0.00***				
	PA Knowledge Baseline				**0.22**	**0.09**	**2.34**	**0.02***
	Group				**0.95**	**0.24**	**3.87**	**0.00***
	Age				**0.16**	**0.10**	**1.71**	**0.09**
	Sex				**0.02**	**0.21**	**0.10**	**0.92**
PA Stage of Change		**13.75 (4, 100)**	**0.36**	**0.00***				
	PA Stage of Change Baseline				**0.63**	**0.10**	**6.41**	**0.00***
	Group				**0.36**	**0.31**	**1.16**	**0.25**
	Age				**0.09**	**0.09**	**0.80**	**0.43**
	Sex				**0.59**	**0.59**	**2.26**	**0.03***
PA Self-efficacy		**9.39 (4, 98)**	**0.27**	**0.00***				
	PA Self-efficacy Baseline				**0.49**	**0.09**	**5.27**	**0.00***
	Group				**0.36**	**0.21**	**1.66**	**0.10**
	Age				**0.06**	**0.08**	**0.73**	**0.47**
	Sex				**0.13**	**0.18**	**0.68**	**0.50**
PA Enjoyment		**6.96 (4, 100)**	**0.22**	**0.00***				
	PA Enjoyment Baseline				**0.55**	**0.11**	**4.78**	**0.00***
	Group				**0.41**	**0.23**	**1.74**	**0.09**
	Age				**0.12**	**0.09**	**1.27**	**0.21**
	Sex				**-0.01**	**0.20**	**-0.06**	**0.96**
MVPA		**23.17 (4, 95)**	**0.49**	**0.00***				
	MVPA Baseline				**0.67**	**0.08**	**8.03**	**0.00***
	Group				**20.04**	**6.13**	**3.27**	**0.00***
	Age				**7.13**	**2.34**	**3.04**	**0.00***
	Sex				**9.79**	**5.33**	**1.84**	**0.07**

*** Statistically significant, $p<0.05$. SE = Standard Error**

Table 3.6: Multiple Regression of FV variables controlling for baseline FV score and group

Dependent Variable	Control Variable	F (df)	R^2	Sig.	$\widehat{\beta}$	SE	t	Sig.
Nutrition Knowledge		1.33 (2, 100)	0.03	0.27				
	Nutrition Knowledge Baseline				0.12	0.16	1.58	0.12
	Group				-0.04	0.05	-0.49	0.63
FV Stage of Change		17.21 (2, 100)	0.26	0.00*				
	FV Stage of Change Baseline				0.54	0.50	5.69	0.00*
	Group				0.10	0.05	0.53	0.60
FV Self-efficacy		6.27 (2, 98)	0.11	0.00*				
	FV Self-efficacy Baseline				0.34	0.31	3.15	0.00*
	Group				0.10	0.06	0.65	0.52
FV Consumption		9.03 (2, 101)	0.15	0.00*				
	FV Consumption Baseline				0.39	0.36	3.8	0.00*
	Group				0.54	0.11	1.18	0.24

*** Statistically significant, p<0.05.**

Table 3.7: Multiple Regression of FV variables

Dependent Variable	Control Variable	F (df)	R^2	Sig.	$\widehat{\beta}$	SE	t	Sig.
Nutrition Knowledge		1.40 (4, 100)	0.02	0.24				
	Nutrition Knowledge Baseline				0.13	0.13	0.68	0.10
	Group				-0.23	0.14	-1.59	0.11
	Age				-0.09	0.06	-1.58	0.12
	Sex				0.07	0.13	0.58	0.56
FV Stage of Change		8.67 (4, 100)	0.26	0.00*				
	FV Stage of Change Baseline				0.53	0.10	5.58	0.00*
	Group				0.03	0.32	0.09	0.93
	Age				-0.03	0.12	-0.23	0.82
	Sex				0.23	0.28	0.80	0.42
FV Self-efficacy		3.27 (4, 98)	0.12	0.01*				
	FV Self-efficacy Baseline				0.34	0.11	3.13	0.00*
	Group				0.60	0.23	0.25	0.80

	Age				-0.03	0.09	-0.31	0.76
	Sex				-0.16	0.20	-0.80	0.42
FV Consumption		4.70 (4, 101)	0.16	0.00*				
	FV Consumption Baseline				0.40	0.10	3.81	0.00*
	Group				1.01	0.76	1.34	0.18
	Age				0.22	0.29	0.73	0.46
	Sex				-0.38	0.67	-0.57	0.57

*** Statistically significant, p<0.05. SE = Standard Error**

Table 3.8: Descriptive statistics with 2x2 ANOVA results for AT Risk PA variables

PA Variables	Group	N	Baseline Mean (SD)	Follow-up Mean (SD)	F (df)	Sig.	Partial Eta Squared
PA Knowledge	Intervention	38	2.89 (0.86)	3.39 (0.72)	6.69 (65)	0.01*	0.09
	Control	29	3.03 (0.82)	2.93 (0.80)			
	Total	67					
PA stage of change	Intervention	38	2.76 (0.43)	3.24 (0.94)	0.66 (67)	0.42	0.01
	Control	31	2.42 (0.56)	2.70 (1.01)			
	Total	69					
PA Self-Efficacy	Intervention	37	2.68 (0.71)	3.00 (0.77)	0.56 (65)	0.45	0.01
	Control	30	2.55 (0.66)	2.72 (0.69)			
	Total	67					
PA Enjoyment	Intervention	38	3.92 (0.60)	4.01 (0.69)	0.67 (66)	0.41	0.01
	Control	30	4.06 (0.67)	3.97 (0.97)			
	Total	68					
MVPA min/day	Intervention	37	20.04 (17.96)	23.63 (16.83)	0.23 (66)	0.63	0.00
	Control	31	16.31 (14.89)	17.83 (18.14)			
	Total	68					

*** Statistically significant, p<0.05.**

Table 3.9: Descriptive statistics with 2x2 ANOVA results for AT Risk FV variables

FV Variables	Group	N	Baseline Mean (SD)	Follow-up Mean (SD)	F (df)	Sig.	Partial Eta Squared
Nutrition Knowledge	Intervention	36	3.67 (0.58)	3.75 (0.44)	0.11 (63)	0.74	0.00
	Control	29	3.62 (0.62)	3.76 (0.51)			
	Total	65					
FV Stage of Change	Intervention	36	2.69 (0.67)	3.17 (1.00)	0.10 (62)	0.75	0.00
	Control	28	2.57 (0.57)	2.96 (0.88)			
	Total	64					
FV Self-Efficacy	Intervention	34	3.09 (0.61)	3.04 (0.10)	1.55 (61)	0.22	0.02
	Control	29	2.84 (0.43)	2.99 (0.67)			
	Total	63					
FV Consumption	Intervention	36	2.63 (2.29)	2.76 (2.17)	0.07 (63)	0.79	0.00
	Control	29	1.70 (1.63)	1.67 (1.41)			
	Total	65					

*** Statistically significant, p<0.05.**

CHAPTER 4: Multiple Health Behavior Change In Filipino Adolescents: Investigating Transfer And Compensation Effects For Fruits and Vegetables, Physical Activity, And Sedentary Behavior.

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Abstract

In 2015, among Filipino high school students in Hawai‘i, only 16% ate five or more fruit and vegetables (FV) per day, only 15% met the physical activity (PA) guideline for at least 60 minutes per day of moderate and vigorous physical activity (MVPA), and 53% had 2 hours or less of computer and video game time on an average school day. As these adolescents continue to fall short of recommended health behaviors, the need for a better understanding of how to combat multiple health behavior risks in Filipino adolescents is needed. The purpose of this study is to explore the possible occurrence of transfer and compensation effect in Filipino adolescents.

Methods: A group of 114 adolescents (86% female) from Waipahu High School (WHS) completed the HART questionnaire, which collected information on demographics (gender and age), PA, FV consumption, and sedentary behavior (SB).

Results: No significant effect was found for transfer or compensation for any of the hypotheses.

Conclusion: This is the first study to analyze transfer and compensation effect in Filipino adolescents. There is limited research on the occurrence of transfer and compensation effects for health behavior change in minority populations. Researchers should investigate transfer and compensation effect of PA, FV consumption, and SB in a larger sample of Filipino adolescents, and other health behaviors (e.g., substance abuse) also.

Introduction

Compared to Caucasian, Native Hawaiian, and Other Pacific Islander adolescents, Filipino adolescents have the lowest percentage of eating five or more fruit and vegetables (FV) per day,[1] meeting the physical activity (PA) guideline for at least 60 minutes per day of moderate and vigorous physical activity (MVPA)[2] and having 2 hours or less of computer and video game time on an average school day[3] in Hawai‘i public high school. These adolescents make up one of the fastest growing minority groups, Asian Americans.[4,5] FV consumption, PA, and sedentary behavior (SB) are important determinants of obesity and chronic disease.[6,7] As these adolescents continue to fall short of recommended health behaviors the need for a better understanding of how to combat multiple health behavior risks in Filipino adolescents is needed.

Until recently, interventions to improve health behavior have tended to focus on individual health behavior risk.[8] The use of Multiple Health Behavior Change (MHBC) interventions for advancing health promotion may offer great potential and advancement to health research and help address the health needs of populations in the future.[9] MHBC addresses two or more health behaviors, either simultaneously or sequentially, within a limited time.[9] Depending on the interaction, PA and FV behaviors may act as gateway behaviors to other health behaviors to create positive change, due to transfer or compensation.[10]

The Compensatory Health Belief (CHB) model posits that the belief a person holds about neutralizing or compensating for the effects of a negative health behavior is offset by engaging in a healthier behavior.[11,12] CHB is a person's justification to engage in negative health behavior.[13] The CHB model attempts to explain why people develop CHB, employ it to control/resist temptations and predict health choices.[13] The major components of the model are cognitive dissonance, goal self-concordance, self-efficacy and implementation plans.[13]

The opposite belief, transfer effect, is when a person will transfer their confidence and knowledge from one good health behavior to another health behavior that needs improvement.[10] Transfer effect is taken from research on learning and teaching.[14] It may depend on the co-occurrence of health behaviors, the similarity of the health behaviors[14] and an individual's ability to take learned skills to another behavior.[15] As Filipino adolescents in Hawai'i fall short of recommended PA and FV consumption behaviors,[1,2] the use of compensation and transfer effect on these health behaviors may have important intervention implications and have yet to be explored.

In 2009, Nigg et al[10] investigated the interrelationships of three health risk behaviors among college students: tobacco use, lack of physical activity, and alcohol consumption. This was one of the first studies that were adequately powered to look at compensation or transfer effects for health behaviors. The study found evidence of transfer effects for non-smoking related to less alcohol use, regular PA to less smoking, and nondrinking to less smoking.[10] For compensation effects they found evidence for the following: regularly active college students consume more alcohol and individuals who drank alcohol did more PA.[10] Nigg et al[10] showed that one could test the relationship among multiple health behaviors and the co-occurrence of transfer and compensation effects.

People with multiple health behavior risks are at increased risk for disability, chronic disease, and premature death.[16] While it is challenging to intervene on a single health behavior, it is even more challenging to address multiple health behaviors.[9] Although there is evidence for the effectiveness of MHBC,[17-19] there is no research that addresses its effect in Filipino adolescents. Due to the lack of research on transfer and compensation in Filipino adolescents, the

purpose of this study was to explore the possible occurrence of these effects in this population, with specific hypotheses for each effect in relation to PA, FV consumption and SB.

Methods

Project Overview

The Health Action Research and Training project (HART) is a partnership between Waipahu High School (WHS), the Hawai‘i Department of Education (DOE), and the University of Hawai‘i Department of Public Health Sciences in Honolulu Hawai‘i. Students from WHS voluntarily participated in the study. Consent and assent forms were collected by WHS teachers before the administration of the baseline questionnaire. Only students who were Filipino and returned consent and assent forms were included in the study. A total of 114 WHS students in grades 9 through 11 (86% female) from nine health classes participated in the study. The HART questionnaire collected information on demographics (gender and age), PA, FV Consumption, and SB behaviors. The University of Hawai‘i IRB and Hawai‘i DOE approved all methods and procedures for the HART study.

Measures

FV Consumption was assessed using three items from the Youth Risk Behavior Surveillance System (YRBSS) survey to prompt how often in the past seven days the participant consumed 100% fruit juices (not including punch, sports drinks, or fruit-flavored drinks), fruits, and vegetables.[20] Response options included: never during the last week; 1 to 3 times per week; 4 to 6 times per week; 1 time per day; 2 times per day; 3 times per day; and, 4 or more times per day. These will be recoded to reflect actual consumption. The YRBSS has been shown to be a valid tool in adolescents when compared with 24-hour dietary recall for frequency of fruit juice, fruit and vegetable consumption.[21]

PA was assessed using an adapted Leisure-Time PA Questionnaire created by Godin and Shephard.[22] Students reported the number of days in a week they performed strenuous, moderate, and mild PA. Strenuous activity is any activity that makes the heart beat quickly and the body sweat. Moderate activity makes a person tired and sweats a little. Mild activity is an activity that takes little effort and does not make one sweat. Along with frequency, students answered questions regarding duration – on average how many minutes (0, 10, 20, 30, 40, 50, and 60+) a day they spent doing a strenuous, moderate, and mild activity. Sallis et al[23] showed this variable is reliable and valid in children and adolescents.

PA frequency was determined by averaging the number of days per the past week students engage in MVPA as well as the minutes per day for each intensity. The total for minutes of MVPA per day was calculated by moderate PA minutes per day plus vigorous PA divided by seven.

A total of six questions were used to assess students' SB. Three questions related to weekday activity and three related to weekend activity. Questions were taken from studies examining SB in college students and adolescents.[24,25] SB was determined by having students choose the number of hours (0-10+ hours) per weekday they spent watching television, videos/movies, and playing video games.[24] The same procedure was repeated for weekend SB. The total hours of SB were calculated by weekday (multiplied by 5) plus the weekend (multiplied by 2) and divided by seven to give the average number of hours of SB per day. Wallace et al[26] reported 1-week test-retest reliabilities for watching television and/or videos (0.72) and using the computer (0.87) in college students.

Classification of PA, FV Consumption, and SB

Two groups for each variable were built to ensure clear differentiation. Any participant who did not meet the group requirements was not included. For the PA hypothesis, students were divided into "High" (≥ 60 min of MVPA/day) or "Low" (≤ 30 min of MVPA/day). The FV consumption hypothesis divided students into "High" (≥ 5 times/day FV) or "Low" (≤ 1 times/day FV). For the SB hypothesis, students were divided into "Low" (≤ 2 hours/day SB) or "High" (≥ 4 hours/day SB). The extreme groups of each measure assisted with determining if any differences exist.

Statistics

Demographic data and the study variables were generated. To assess group differences between High and Low MVPA, FV consumption, and SB from baseline to follow-up, a 2-way ANOVA was calculated for each hypothesis. (Table 4.1) Significance was set *a priori* at <0.05. Data analysis was interpreted via SPSS 22.0 (SPSS Worldwide Headquarters, Chicago, IL).

Results

A total of 114 adolescents (86% female) participated in the baseline HART questionnaire. Means, standard deviations (SD), and significance for each hypothesis for FV consumption, SB, and PA are shown in Table 4.2.

Hypothesis 1

Hypothesis H1a examined whether FV consumption was transferred or compensated for by PA High vs. Low students between baseline and follow-up. No significant difference was found for change in FV consumption in High vs. Low PA Filipino adolescents ($F(1, 72)=0.18$, $p=0.67$). There was no significant effect found for Hypothesis H1b examining transfer and compensation effect of SB for PA in High vs. Low Filipino adolescents ($F(1, 72)=1.31$, $p=0.25$).

Hypothesis 2

The second hypothesis examined whether Filipino adolescents with High vs. Low FV consumption had a transfer or compensation effect for H2a) PA and H2b) SB level. There was no transfer or compensation effect found for either H2a PA ($F(1, 45)=0.49$, $p=0.49$) or H2b SB ($F(1, 46)=0.00$, $p=.95$).

Hypothesis 3

The final hypothesis examined whether Filipino adolescents who have Low vs. High SB had a transfer or compensation effect for H3a) PA and H3b) FV consumption. A trend towards a significant effect was found for H3a PA ($F(1, 76)=3.76$, $p<0.06$) with a possible transfer effect seen for PA Low (M=30.15(22.80) to 37.46(29.02)). No significant effect was found for H3b FV consumption ($F(1, 77)=0.34$, $p=0.56$).

Discussion

The purpose of this study was to explore the occurrence of transfer and compensation effects in Filipino adolescents, with specific hypotheses for each effect in relation to PA, FV consumption and SB. The overall effect found was that these behaviors are not related to each other. The lack of significance found for all hypotheses could be due to inadequate power. Other studies that have found evidence of transfer and compensation effect for health behaviors have had much larger sample sizes.[10,27,28] The hypotheses SB on PA was the only one that showed a trend towards significance and had the evenest sample in each category. Possible reasons for the lack of significance found for each hypothesis will be discussed separately.

The finding of no transfer or compensation effect for hypotheses FV consumption on SB and SB on FV consumption may be due to adolescents feeling they have little to no control over their dietary intake and SB. Adolescence is a transitional time in which health behaviors are influenced by peers and family.[29] Geller et al[30] examined parental and friend influences on health

behaviors in Filipino adolescents in Hawai‘i. In the study, adolescents reported parents as the dominant influence on their dietary intake and SB.[30] Wansink[31] stated, in the home, the nutritional gatekeeper (parent) controlled 72% of the food eaten by their children either directly or indirectly. Parental control over what food is provided and what activities the child is encouraged to engage in could directly affect an adolescent's ability to change health behaviors.

Previous studies have found a positive association between PA level and healthy diet behaviors in adolescents.[32,33] While these behaviors may be associated, we found no evidence of transfer or compensation effect for PA and FV consumption behaviors (PA on FV consumption and FV consumption on PA) on each other. This could be because an adolescent's social priorities are not focused on changing or improving these health behaviors. Over half of the Filipino adolescents in the Geller et al[30] study reported weight management as a reason for dietary behavior change. This focus could translate into a variety of different dietary behaviors that do not necessarily focus on FV consumption. When viewing the whole the diet, Fleig et al[28] found that those who regularly exercised transferred these competencies into healthy nutrition within six months. Focusing more on an overall healthy diet and PA for transfer and compensation effect in this population may provide better results.

When addressing PA in this population it should be noted that Geller et al. found time with friends was more conducive to PA, but, overall, most time was spent watching television or working on the computer.[30] Adolescents in the study also reported a lack of time to be PA due to school and/or work.[30] This may help explain why only a trend towards significance was found for SB on PA. This demonstrates, though, that those with low SB increased their PA more than those in the high SB category. This suggests that adolescents in the low SB choose to do something else, like be PA, rather than watch TV or play video games during their free time.

There are several limitations to this study. First, study outcomes were based on a self-report questionnaire, introducing the risk of social desirability bias. The adolescent sample was small, all Filipino and predominantly females, limiting its generalizability. Notwithstanding these limitations, this is the first study to analyze transfer and compensation effect in Filipino adolescents. There is limited research on these effects for health behavior in minority adolescents and warrants further research.[10] Therefore, studies focused on MHBC in this adolescent population should reinvestigate transfer and compensation effect of PA, FV consumption, and SB in a larger sample, and investigate other possible health behaviors (substance abuse, overall diet, and sleep). Another approach might be to investigate transfer and compensation effects over shorter time periods. This study was done over a span of 6 months and transfer and compensation may have occurred over shorter time periods of time. Lastly, there should be research done in other adolescent populations in Hawai‘i and Pacific Island areas to explore the use of the Compensatory Health Belief Model and transfer effect to help determine influencing factors on health behavior.

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References

1. PAN Plan Target Teen Fruit and Vegetable Consumption. 2015; http://www.hawaiihealthmatters.org/modules.php?op=modload&name=NS-Indicator&file=indicator&indid=3000263000407&iid=11662171, 2016.

2. Teens Who Meet Aerobic Physical Activity Guidelines 2015. 2015; http://www.hawaiihealthmatters.org/modules.php?op=modload&name=NS-Indicator&file=indicator&indid=3000523000407&iid=11651993, 2016.

3. Teens with 2 Hours or Less of Computer and Video Game Time. Hawaii Department of Health; 2015. http://www.hawaiihealthmatters.org/index.php?module=indicators&controller=index&action=view&indicatorId=1869&localeId=14. Accessed September 9, 2016.

4. Equity OoMHaH. Center for Disease Control- Asian American Populations. 2013; http://www.cdc.gov/minorityhealth/populations/REMP/asian.html. Accessed January 25, 2016.

5. The Asian Population: 2010. United States Department of Commerce Economics and Statistics Administration; 2010. https://www.census.gov/newsroom/releases/archives/2010_census/cb12-cn22.html.

6. *Dietary Guidelines for Americans 2015-2020.* Office of Disease Prevention and Health Promotion2015.

7. *Physical Activity Guidelines for Americans.* Office of Disease Prevention and Health Promotion2008.

8. Busch V, de Leeuw JR, de Harder A, Schrijvers AJ. Changing multiple adolescent health behaviors through school-based interventions: a review of the literature. *J Sch Health.* 2013;83(7):514-523.

9. Prochaska JJ, Nigg CR, Spring B, Velicer WF, Prochaska JO. The benefits and challenges of multiple health behavior change in research and in practice. *Prev Med.* 2010;50(1-2):26-29.

10. Nigg CR, Lee HR, Hubbard AE, Min-Sun K. Gateway health behaviors in college students: investigating transfer and compensation effects. *J Am Coll Health.* 2009;58(1):39-44.

11. Knauper B, Rabiau M, Cohen O, Patriciu N. Compensatory health beliefs: scale, development and psychometric properties. *Psychology of Health.* 2004;19:607-624.

12. Kaklamanou D, Armitage CJ. Testing compensatory health beliefs in a UK population. *Psychol Health.* 2012;27(9):1062-1074.

13. Rabiau M, Knauper B, Miquelon P. The eternal quest for optimal balance between maximizing pleasure and minimizing harm: The compensatory health beliefs model. *British Journal of Health Psychology.* 2006(11):139-153.

14. Flay B, Petraitis J, eds. *The Theory of Triadic Influence: a New Theory of Health Behavior with Implications for Preventive Interventions.* Greenwich, CT: JAI Press; 1994. G A, ed. Advances in Medical Sociology, A Reconsideration of Models of Health Behavior Change; No. IV.

15. Perkins D, Salmon G, eds. *Transfer and Learning.* 2nd ed: Pergamom Press; 1994. Husen T, Postlethwaite T, eds. International Encyclopedia of Education.

16. Prochaska JO. Multiple Health Behavior Research represents the future of preventive medicine. *Prev Med.* 2008;46(3):281-285.

17. Prochaska JJ, Sallis JF. A randomized controlled trial of single versus multiple health behavior change: promoting physical activity and nutrition among adolescents. *Health Psychol.* 2004;23(3):314-318.

18. de la Haye K, D'Amico EJ, Miles JN, Ewing B, Tucker JS. Covariance among multiple health risk behaviors in adolescents. *PLoS One.* 2014;9(5):e98141.

19. Wada RK, Glaser DW, Bantum EO, et al. Hawai'i's multiethnic adolescent and young adult survivors of childhood cancer: are their health behavior risks similar to state and national samples? *Hawaii J Med Public Health.* 2013;72(11):380-385.

20. Youth Risk Behavior Surveillance System. http://www.cdc.gov/healthyyouth/data/yrbs/index.htm. Accessed February 21, 2016.

21. Eaton D, Olsen E, Brener N, et al. A comparison of fruit and vegetable intake estimates from three survey question sets to estimates from 24-hour dietary recall interviews. *J Acad Nutr Diet.* 2013:113(9):1165-1174.

22. Godin G, Shephard RJ. A simple method to assess exercise behavior in the community. *Can J Appl Sport Sci.* 1985;10(3):141-146.

23. Sallis JF, Buono MJ, Roby JJ, Micale FG, Nelson JA. Seven-day recall and other physical activity self-reports in children and adolescents. *Med Sci Sports Exerc.* 1993;25(1):99-108.

24. Buckworth J, Nigg C. Physical activity, exercise, and sedentary behavior in college students. *J Am Coll Health.* 2004;53(1):28-34.

25. Gordon-Larsen P, McMurray RG, Popkin BM. Adolescent physical activity and inactivity vary by ethnicity: The National Longitudinal Study of Adolescent Health. *J Pediatr.* 1999;135(3):301-306.

26. Wallace LS, Buckworth J, Kirby TE, Sherman WM. Characteristics of exercise behavior among college students: application of social cognitive theory to predicting stage of change. *Prev Med.* 2000;31(5):494-505.

27. Fleig L, Lippke S, Pomp S, Schwarzer R. Intervention effects of exercise self-regulation on physical exercise and eating fruits and vegetables: a longitudinal study in orthopedic and cardiac rehabilitation. *Prev Med.* 2011;53(3):182-187.

28. Fleig L, Kerschreiter R, Schwarzer R, Pomp S, Lippke S. 'Sticking to a healthy diet is easier for me when I exercise regularly': cognitive transfer between physical exercise and healthy nutrition. *Psychol Health.* 2014;29(12):1361-1372.

29. Yang F, Tan KA, Cheng WJ. The effects of connectedness on health-promoting and health-compromising behaviors in adolescents: evidence from a statewide survey. *J Prim Prev.* 2014;35(1):33-46.

30. Geller K, Alvarez A, Nigg C, Okay A, Timbobolan J. Parent and Friend Influences on the Multiple Health Behaviors of Adolescents in Hawai'i. *California Journal of Health Promotion.* 2014;12(2):55-68.

31. Wansink B. Nutritional gatekeepers and the 72% solution. *Journal of the American Dietetic Association.* 2006;106:1324-1327.

32. Lowry R, Michael S, Demissie Z, Kann L, Galuska DA. Associations of Physical Activity and Sedentary Behaviors with Dietary Behaviors among US High School Students. *J Obes.* 2015;2015:876524.

33. Ottevaere C, Huybrechts I, Benser J, et al. Clustering patterns of physical activity, sedentary and dietary behavior among European adolescents: The HELENA study. *BMC Public Health.* 2011;11:328.

34. Dishman RK, Motl RW, Saunders R, et al. Enjoyment mediates effects of a school-based physical-activity intervention. *Med Sci Sports Exerc.* 2005;37(3):478-487.

35. Dishman RK, Motl RW, Saunders R, et al. Self-efficacy partially mediates the effect of a school-based physical-activity intervention among adolescent girls. *Prev Med.* 2004;38(5):628-636.

Table 4.1: Study Hypotheses

Item	Transfer Hypotheses	Compensation Hypotheses
PA		
H1a: High vs. Low	↑ FV consumption	↓ FV consumption
H1b: High vs. Low	↓ SB	↑ SB
FV Consumption		
H2a: High vs. Low	↑ PA	↓ PA
H2b: High vs. Low	↓ SB	↑ SB
SB		
H3a: Low vs. High	↑ PA	↓ PA
H3b: Low vs. High	↑ FV consumption	↓ FV consumption

Note: Hypothesis (H); Physical Activity (PA); Fruit and Vegetable (FV); Sedentary Behavior (SB); Increase (↑); Decrease (↓ or no change)

Table 4.2: Means, SD, and Significance for each Hypotheses

Hypotheses	N	M Base (SD)	M Post (SD)	F, df (p-value)
H_{1a}: FV consumption				
PA High	**11**	**3.69 (3.21)**	**3.67 (3.02)**	**0.18, (1, 72) (0.67)**
PA Low	**63**	**2.30 (2.07)**	**2.61 (2.22)**	
H_{1b}: SB				
PA High	**12**	**138.57 (112.22)**	**84.28 (46.64)**	**1.31, (1, 72) (0.25)**
PA Low	**62**	**195.07 (137.81)**	**182.63 (128.81)**	
H_{2a}: PA				
FV High	**16**	**26.78 (24.75)**	**31.42 (26.12)**	**0.49, (1, 45) (0.49)**
FV Low	**31**	**22.90 (22.17)**	**22.35 (21.17)**	
H_{2b}: SB				
FV High	**17**	**157.81 (124.69)**	**136.64(129.09)**	**0.00, (1, 46) (0.95)**
FV Low	**31**	**227.28 (159.77)**	**203.78 (149.43)**	
H_{3a}: PA				
SB Low	**45**	**30.16 (22.80)**	**37.46 (29.02)**	**3.76, (1, 76) (0.06)**

SB High	**33**	**22.55 (20.03)**	**22.94 (19.15)**	
H_{3b}: FV consumption				
SB Low	**45**	**2.70 (2.29)**	**3.28 (2.46)**	**0.34, (1, 77) (0.56)**
SB High	**34**	**2.18 (1.90)**	**2.43 (2.01)**	

Note: H = Hypothesis; SD = Standard Deviation; significant on p<.05; PA = Physical Activity in moderate to vigorous minutes per day; FV = fruit and vegetable in servings per day; and, SB = sedentary behavior in minutes per day.

Table 4.3: Findings of Study Hypotheses

Item	Transfer Hypothesis	Compensation Hypothesis
PA		
H1a: High vs. Low	**No FV**	**No FV**
H1b: High vs. Low	**No SB**	**No SB**
FV Consumption		
H2a: High vs. Low	**No PA**	**No PA**
H2b: High vs. Low	**No SB**	**No SB**
SB		
H3a: Low vs. High	**↑ PA**	**No PA**
H3b: Low vs. High	**No FV**	**No FV**

Note: H = Hypothesis; PA = Physical Activity; FV = Fruit and Vegetable; SB = Sedentary Behavior, and No = no transfer/compensation.

Chapter 5: Improving Physical Activity And Fruit And Vegetable Consumption Social Cognitive And Behavior Variables In Filipino Adolescents Becoming Peer Educators.

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Abstract

A promising approach in changing health social cognitive and behavior variables involves peer-led initiatives. Peer educators (PEs) are individuals from the same population who are trained to assist or educate the target population. Filipino adolescents are one of the most overweight and obese ethnic groups in Hawai‘i. Research focused on decreasing health disparities in this population is needed. The use of PEs has not been examined to a high degree in Filipino adolescents and could have the potential to impact health behavior. The current research study aims to help fill this need by investigating changes in PA and FV consumption beliefs and behavior in Filipino adolescents as PEs over a one-year period quantitatively.

Methods: Nineteen senior (73.7% female) health capstone students from Waipahu High School (WHS) were trained in the research process and taught how to deliver a physical activity (PA) and nutrition curriculum as PEs. PEs completed the PA and nutrition questionnaire at the start of training and upon the completion of delivering the curriculum.

Results: A significant effect was found for PA stage of change ($F(1, 18)=5.5$, $p=0.03$) and moderate and vigorous PA (MVPA) ($F(1, 18)=7.44$, $p=0.01$) only.

Conclusion: Pilot study shows that Filipino adolescents trained as PEs can change their PA stage of change and MVPA. Future studies should add a control class to draw conclusions on whether becoming a PE creates positive PA and FV consumption social cognitive and behavior change.

Introduction

A promising approach to changing health behavior involves peer-led initiatives.[1-3] Peer educators (PEs) are individuals from the same population who are trained to assist in educating or educate the target population.[4] The use of PEs is rooted in the Social Cognitive Theory, where an individual's attitude and behavior can be influenced by the interaction and observation of others.[5] Peer educators (PEs) can be positive role models who directly affect their social environment to help change health behaviors.[1-3] Studies using peer-led initiatives have shown PEs can improve their peers' self-efficacy, knowledge, attitudes and behaviors, as well as their own.[1,2]

Adolescent peer-led health promotion initiatives have been used in substance abuse prevention [6,7] and obesity prevention programs.[1-3] There is little to be found quantitatively measuring adolescents as PEs who increase their own physical activity (PA) and fruit and vegetable (FV) consumption behavior.[1-3] Story et al[1] conducted a longitudinal PEs study that included Asian adolescents as health instructors using a health curriculum to change nutrition belief and behavior in adolescents. The PEs were only measured qualitatively at follow-up after the first year, and the study did not distinguish Asian subgroups that participated in the study.[1] Observational measures, from the study, found students enjoyed being PEs and thought they learned more and ate better through becoming PEs.[1] Healthy Buddies, a school-based, peer-led health curriculum, quantitatively measured adolescent PEs for healthy living behaviors (questionnaire, physical fitness and anthropometric).[2] PEs significantly improved their health knowledge (nutrition and PA) over the course of the intervention.[2] These studies support that a peer-led health curriculum has the potential to change health social cognitive and behavior variables in PEs and has good feasibility as a health curriculum intervention component.[1,2]

Compared with Other Asian and Japanese public high school students, Filipino adolescents have a higher percentage of being overweight[8] and obese[9] in Hawai‘i. They also have one of the lowest percentages of eating five or more FV per day (16%)[10] and meeting the PA guideline for at least 60 minutes per day of moderate to vigorous PA per day (15%), compared to Caucasian, OPI, and Native Hawaiian public high school students in Hawai‘i.[11] The combination of being inactive and having low FV consumption during adolescence increases the likelihood of developing chronic diseases.[12,13] In a 2007 review by Joyce et al,[14] Filipino children and adolescents in the United States have higher disparities of being overweight and inactive when compared to white children or other Asian Pacific Islander subgroups. With Filipino adolescents being one of the most overweight[8] and obese[9] ethnicity groups in Hawai‘i it is important to have health research that focuses on decreasing inactivity and chronic diseases in this population.

The use of PEs has not been examined solely in Filipino adolescents and could have the potential to impact health beliefs and behavior. Therefore, the current research study aims to fill this gap by investigating changes in PA and FV consumption beliefs and behavior in Filipino adolescents as PEs over a one-year period quantitatively. This is the first study to measure PA and FV consumption beliefs and behavior change quantitatively in Filipino adolescents as PEs and could provide needed insight into these social cognitive and behavior variables in this adolescent population.

Methods

This study is part of the Waipahu Health Action Research and Training (HART) project, which aims to promote PA and healthy nutrition in a classroom-based setting using senior health capstone students' (PEs) positive influence on underclass students to create healthy habits.

Waipahu HART is a partnership between The Waipahu High School (WHS), Hawai‘i Department of Education (DOE), and University of Hawai‘i Department of Public Health Sciences in Honolulu, Hawai‘i. The University of Hawai‘i Institute Review Board (IRB) and Hawai‘i DOE approved all methods and procedures for the HART study.

The current study is a pre-post intervention investigating whether adolescents becoming PEs can change their beliefs and health behaviors about PA and FV consumption. The same questionnaire was used to evaluate the PEs' health behaviors and those of the underclass students with whom they worked. The HART questionnaire was self-report and built specifically for the HART curriculum. Questions were chosen for the study based on reflecting the SCT's three factors (cognitive, behavioral, and environmental),[5] each of which is reflected in the HART curriculum. Only students who were Filipino and returned consent and assent forms were included in the study.

HART Curriculum Description

Each PE was provided two curriculum-training folders, one for the fall (lessons 1-4) and one for the spring (lessons 5-8). Each folder contained all lessons that were to be taught. Within each lesson, there were three main items: an outline of the lesson; a script of the entire lesson; and, specific worksheets and handouts for the lesson. The outline of each lesson includes a warm-up, activities, and a cool down. The warm-up for each week was delivered through an icebreaker game and a discussion of the previous week's activities. The activities for each group varied depending on the topic to be covered, physical activity and/or nutrition. The activities were informed by pilot work and the social cognitive theory[5] and addressed knowledge, individual motivational factors, skills, and the environment. The cool down for each week included explanations of the homework for the next week. Take home assignments were given

for each lesson to encourage and foster the information the students were taught. The topics of the curriculum are highlighted below.

The 8 lesson topics and related homework of the HART curriculum are:

1. Introduction to Nutrition and Physical Activity
    a. Homework: My Plate and Physical Activity Pamphlet
2. The Ingredients of Nutrition and Physical Activity
    a. Homework: Reading Food Labels and incorporating Frequency, Intensity, Time and Type (FITT) into daily physical activity
3. Eating the Rainbow and Variety in Physical Activity
    a. Homework: Influencing Family Shopping & Try a New Activity
4. Eating Out and Working Out
    a. Homework: Staying healthy over the Holidays
5. Refresher on Carbohydrates, Fats, and Proteins and Different Forms of Physical Activity
    a. Homework: Using Food Labels to make healthy choices and searching the web to find an aerobic activity to try. Creating a poster for display at school.
6. Small Changes
    a. Homework: Find a healthier version of a favorite food to make and searching the web to find a strength-based workout to try.
7. Gathering Social Support to Ensure Success
    a. Homework: Group members encourage each other to increase FV consumption and search the web to find a flexibility and balance workout to try.
8. Positive Attitude for a Positive Life
    a. Homework: Be healthy and make healthy choices

PEs were trained over a five-week period in the fall and the spring, two times a week by research staff. Training consisted of PEs learning about the research process, each lesson and what it entailed, being broken into groups and building group power points for each lesson, and practice teaching the lesson to classmates. All participants signed consent and assent forms. PEs completed the HART PA and Nutrition Questionnaire at the initial meeting with HART research staff and then again after the teaching of lesson eight. The class teacher assigned any student wishing not to participate in the HART questionnaire different work during the administering of the questionnaire. Upon completing training PEs, in groups of 2-3 students, taught an underclass (grades 9-11) their assigned HART lesson. At the beginning of lesson one and completion of lesson eight PEs administered the HART Questionnaire. The PA and FV consumption social cognitive and behavior variables are listed;

Social Cognitive

Nutrition Knowledge questions were created based on information gathered in the initial development of the Waipahu HART project and created to reflect the HART curriculum.[15] Four true/false questions were used to address food groups, label reading, FV, and recommendations. Questions answered correctly were summed to obtain a score. Face validity, the extent which a test is subjectively viewed as covering the concept it purports to measure,[16] was confirmed via a Ph.D. and a Master level judge who developed and were familiar with the curriculum. The items were specifically evaluated in terms of representing the content of the HART topics.

PA Knowledge items were generated specifically for the content of the Waipahu HART curriculum based on initial development the Waipahu HART project.[15] Questions addressed intensities, PA types, energy balance, and recommendations. Four questions were used, with replies being true and false and the correct answers were summed to obtain a score. Face validity,

the extent which a test is subjectively viewed as covering the concept it purports to measure,[16] was confirmed via a Ph.D. and a Master level judge who developed and were familiar with the curriculum. The items were specifically evaluated in terms of representing the content of the HART topics.

PA Stages of Change used one question to assess an individual's readiness to participate in regular PA. Individuals were asked about participating in sixty minutes per day of PA, at least five days or more a week, with the PA making the heart beat faster or breathing harder. Answers were classified as precontemplation, contemplation, preparation, action, or maintenance, based on the stages of Transtheoretical Model (TTM).[17] The TTM has parallels to the SCT (self-efficacy and enjoyment) but goes beyond only behavior to help understand the change process. Students were classified as 1) precontemplation if they do not plan to start doing regular PA in the next six months, 2) contemplation if they do not but plan to start doing regular PA in the next six months, 3) preparation if they do not but plan to start doing regular PA in the next thirty days, 4) action if they have been doing regular PA but for less than six months, and 5) maintenance if they have done so for more than six months, respectively.[18] PA stages of change have shown to be valid in adolescents.[19]

FV Stages of Change used one question to assess an individual's readiness to consume four and a half cups or more of FV each day (one cup = one small apple = one baseball = one tennis ball). Answers were classified as precontemplation, contemplation, preparation, action, or maintenance, based on the stages of TTM.[17] Students were classified as 1) precontemplation if they do not eat four and a half cups or more of FV a day and do not intend to start in the next six months, 2) contemplation if they do not eat four and a half cups or more of FV a day but do intend to start in the next six months, 3) preparation if they do not eat four and a half cups or

more of FV a day but intend to start in the next thirty days, 4) action if they do eat four and a half cups or more of FV a day and have done so for less than six months, and 5) maintenance if they have done so for more than six months, respectively.[20] Validity and reliability of this scale has been shown in African-American adolescents.[21]

FV Self-Efficacy was measured using six questions asking "How CONFIDENT are you that you would be able to eat vegetables and fruits when: 1) eating at a restaurant; 2) hands and fingers hurt when have to cut or peel them; 3) it's hard to get to store to buy; 4) had a hard day and not feeling good; 5) cooking vegetables is difficult to do; and, 6) fruit and vegetables don't taste good to you"? The answers to the six questions were on a 5-point Likert-type scale with 1 (not at all confident), 2 (not very confident), 3 (moderately confident), 4 (very confident) 5 (completely confident). The mean of the items was used. A previous study has shown the FV self-efficacy scale to be reliable and valid in adolescents.[22]

PA Self-Efficacy measured confidence to be PA when one of six specific barriers existed: 1) when it is raining, snowy or icy; 2) under a lot of stress; 3) when I don't have the time; 4) when I have to exercise alone; 5) don't have access to a place to exercise; and, 6) when I am spending time with friends. The answers to the six questions used a 5-point Likert-type scale with 1 (not at all sure), 2 (somewhat sure), 3 (moderately sure), 4 (very sure) 5 (completely sure). The mean of all items was used. The PA self-efficacy scale adequately fit data for a large random sample of people living in Hawai‘i.[23] Also, factorial invariance of the PA self-efficacy scale was documented across age, gender, group and ethnicity.[23] Internally consistent of this scale for adults living in Hawai‘i was 0.85.[23]

PA Enjoyment described how participants felt about being active.[24] The variable was composed of five questions (I enjoy it, my body feels good, I get something good out of it, it's

very exciting, and it feels good) using a 5-point Likert-type scale from 1 (disagree a lot), 2 (disagree a little), 3 (neutral), 4 (agree a little), and 5 (agree a lot). The mean of the items was used. This scale has been found to be a valid and reliable measure of PA enjoyment in children with asthma.[25]

Behaviors

Physical Activity was assessed using an adapted Leisure-Time Physical Activity Questionnaire created by Godin and Shephard.[26] Students reported the number of days in a week they performed strenuous, moderate, and mild PA. Strenuous activity is any activity that makes the heart beat quickly and sweats. An activity that makes one tired and sweats a little is moderate activity. Mild activity is any activity that takes little effort and does not make one sweat. In addition to frequency, students answered questions regarding duration – on average how many minutes (0, 10, 20, 30, 40, 50, and 60) a day they spent doing a strenuous, moderate, and mild activity. Sallis et al[27] showed this measure is reliable and valid in children and adolescents.

FV Consumption was assessed using three items from the Youth Risk Behavior Surveillance System (YRBSS) survey to prompt how often in the past seven days the participant consumed 100% fruit juices (not including punch, sports drinks, or fruit-flavored drinks), fruits, and vegetables.[28] Response options include: never during the last week; 1 to 3 times per week; 4 to 6 times per week; 1 time per day; 2 times per day; 3 times per day; and, 4 or more times per day. These were recoded to reflect total consumption per a day. The YRBSS has been shown to be a valid tool in adolescents when compared with 24-hour dietary recall for frequency of fruit juice, fruit and vegetable consumption.[29]

Statistics

HART data entry and analyses were conducted via SPSS 22.0 (SPSS Worldwide

Headquarters, Chicago, IL). Significance was set *a priori* at <0.05. A Repeated Measures ANOVA looking pre to post on the change in PA and FV consumption social cognitive and behavior variables was run.

Results

A total of 19 adolescents (73.7% female) completed the HART questionnaire.

PA Variables Results

Descriptive statistics with results for PA variables is provided in Table 5.1. A significant effect was found for PA stage of change ($F(1, 18)=5.51$, $p<0.05$) and MVPA ($F(1, 18)=7.44$, $p<0.01$). There was no significant found for PA knowledge ($F(1, 18)=0.58$, $p=.045$), PA self-efficacy ($F(1, 17)=0.44$, $p=0.51$) or PA enjoyment ($F(1, 17)=0.56$, $p=0.46$).

FV consumption Variable Results

Table 5.2 provides all descriptive and results for FV consumption variables. There was no significant effect found for Nutrition knowledge ($F(1, 18)=0.32$, $p=0.58$), FV stage of change ($F(1, 18)=1.02$, $p=0.31$), FV self-efficacy ($F(1, 16)=0.63$, $p=0.44$) or FV consumption ($F(1, 18)=2.95$, $p=0.10$).

Discussion

This is the first study to investigate the effect of adolescent Filipino PEs changing their PA and FV consumption social cognitive and behavior variables quantitatively. This study demonstrated, using the SCT, that adolescents can progress through PA stage of change and increase their MVPA through becoming educators. The SCT assumes that individual cognitive factors and behaviors interact and reciprocate with each other to create change.[5] Even with the limited finding, this pilot study is innovative in that it is one of the few to analyze PEs quantitatively.[2] The majority of studies using adolescent PEs have focused only on measuring

students receiving the curriculum[1-3] or measuring PEs qualitatively.[1] Also, there have been studies done on these social cognitive and behavior variables in adolescents, but none with a focus specifically on Filipinos as PEs.

It should be noted that the PEs are all Health Capstone students and have had four years of health education. The health knowledge taught to these students over the past four years may not have had much focus on PA, explaining the significance found for two of the PA variables, and none of the FV consumption variables. The Hawai‘i DOE requires high school students to take 1.0 credit of physical education for graduation and gives daily 20-minute recess breaks during which students are encouraged to be moderate to vigorously active.[30] These student PEs, though, through learning about different kinds of PA, ways to be PA, how to overcome challenges to being PA, and then teaching what they learned, changed their own PA. Policy should be put in place in Hawai‘i public high schools that help adolescents increase their PA.

Given these students still live at home, they may have little to no control on increasing their FV consumption.[15,31] There may be a long-term effect that needs to be measured in this adolescent age group when they have more freedom of choice. Also, we do not know how becoming a PE may have influenced other poor nutrition (skipping meals, fast food consumption, sugar-sweetened beverages) habits in this population. Research should expand beyond FV consumption to see how becoming a PE influences other nutrition behavior. Lastly, using students as PEs who are not enrolled in health courses could show different effects.

This study has several limitations. First, this was a pilot study investigating if PEs can change their social cognitive and behavior variables. The study design for the Waipahu HART project is quasi-experimental giving researchers the inability to randomly assign who received the intervention. There was also no control group to compare results to PEs' results, thus limiting

the ability to draw conclusions on whether becoming a PE creates positive PA and FV consumption social cognitive and behaviors. A self-report questionnaire was used to measure PA and FV consumption social cognitive and behavior change in PEs, which could lead to social desirability biases. The small sample size of Filipino adolescents used in this pilot study also limits generalizability and could explain limited findings. Further conclusions may be drawn with a larger sample together with having a control group for comparison.

Conclusion

This pilot study shows that Filipino adolescents trained as PEs to deliver a health curriculum can change their PA and FV consumption social cognitive and behavior variables. Future research with a larger sample size and a control group for comparison may see more significant changes. Given the currently limited research on Filipino adolescents' PA and FV consumption social cognitive and behavior variables, this study adds to the literature even with these limitations.

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References

1. Story M, Lytle LA, Birnbaum AS, Perry CL. Peer-led, school-based nutrition education for young adolescents: feasibility and process evaluation of the TEENS study. *J Sch Health.* 2002;72(3):121-127.

2. Stock S, Miranda C, Evans S, et al. Healthy Buddies: a novel, peer-led health promotion program for the prevention of obesity and eating disorders in children in elementary school. *Pediatrics.* 2007;120(4):e1059-1068.

3. Gittelsohn J, Dennisuk LA, Christiansen K, et al. Development and implementation of Baltimore Healthy Eating Zones: a youth-targeted intervention to improve the urban food environment. *Health Educ Res.* 2013;28(4):732-744.

4. Khan NA, Nasti C, Evans EM, Chapman-Novakofski K. Peer education, exercising, and eating right (PEER): training of peers in an undergraduate faculty teaching partnership. *J Nutr Educ Behav.* 2009;41(1):68-70.

5. Bandura A. Health promotion by social cognitive means. *Health Educ Behav.* 2004;31(2):143-164.

6. Komro KA, Perry CL, Veblen-Mortenson S, Williams CL. Peer participation in Project Northland: a community-wide alcohol use prevention project. *J Sch Health.* 1994;64(8):318-322.

7. Perry CL, Komro KA, Veblen-Mortenson S, et al. The Minnesota DARE PLUS Project: creating community partnerships to prevent drug use and violence. *J Sch Health.* 2000;70(3):84-88.

8. Community Dashboard: Teens who are Overweight. 2015; Hawaii by Race/Ethnicity for Health Behaviors. Available at: http://www.hawaiihealthmatters.org/modules.php?op=modload&name=NS-Indicator&file=indicator&iid=11662182&Submit=Go, 2016.

9. Hawaii Health Matters: Teens who are Obese. 2015; http://www.hawaiihealthmatters.org/index.php?module=indicators&controller=index&action=view&indicatorId=1312&localeId=14. Accessed September 2, 2016.

10. PAN Plan Target Teen Fruit and Vegetable Consumption. 2015; http://www.hawaiihealthmatters.org/modules.php?op=modload&name=NS-Indicator&file=indicator&indid=3000263000407&iid=11662171, 2016.

11. Teens Who Meet Aerobic Physical Activity Guidelines 2015. 2015; http://www.hawaiihealthmatters.org/modules.php?op=modload&name=NS-

Indicator&file=indicator&indid=3000523000407&iid=11651993, 2016.

12. Lowry R, Michael S, Demissie Z, Kann L, Galuska DA. Associations of Physical Activity and Sedentary Behaviors with Dietary Behaviors among US High School Students. *J Obes.* 2015;2015:876524.

13. Prochaska JJ, Sallis JF. A randomized controlled trial of single versus multiple health behavior change: promoting physical activity and nutrition among adolescents. *Health Psychol.* 2004;23(3):314-318.

14. Joyce J, Lynne H, Fernando M. Filipino Child Health in the United States: Do Health and Health Care Disparities Exist? *Preventing Chronic Disease.* 2007;4(2):20. https://www.cdc.gov/pcd/issues/2007/apr/06_0069.htm.

15. Geller K, Alvarez A, Nigg C, Okay A, Timbobolan J. Parent and Friend Influences on the Multiple Health Behaviors of Adolescents in Hawai'i. *California Journal of Health Promotion.* 2014;12(2):55-68.

16. Greco L, Walop W, McCarthy R. Questionnaire development: 2. Validity and reliability. *Clinical Epidemiology.* 1987;136:699-700.

17. Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. *Am J Health Promot.* 1997;12(1):38-48.

18. Schumann A, Nigg CR, Rossi JS, et al. Construct validity of the stages of change of exercise adoption for different intensities of physical activity in four samples of differing age groups. *Am J Health Promot.* 2002;16(5):280-287.

19. Parker PD, Martin AJ, Martinez C, Marsh HW, Jackson SA. Stages of change in physical activity: A validation study in late adolescence. *Health Educ Behav.* 2010;37(3):318-329.

20. Greene GW, Fey-Yensan N, Padula C, Rossi S, Rossi JS, Clark PG. Differences in psychosocial variables by stage of change for fruits and vegetables in older adults. *J Am Diet Assoc.* 2004;104(8):1236-1243.

21. Di Noia J, Mauriello L, Byrd-Bredbenner C, Thompson D. Validity and reliability of a dietary stages of change measure among economically disadvantaged African-American adolescents. *Am J Health Promot.* 2012;26(6):381-389.

22. Hagler AS, Norman GJ, Radick LR, Calfas KJ, Sallis JF. Comparability and reliability of paper- and computer-based measures of psychosocial constructs for adolescent fruit and vegetable and dietary fat intake. *J Am Diet Assoc.* 2005;105(11):1758-1764.

23. Paxton RJ, Nigg CR, Motl RW, et al. Are constructs of the transtheoretical model for physical activity measured equivalently between sexes, age groups, and ethnicities? *Ann Behav Med.* 2008;35(3):308-318.

24. Paxton RJ, Nigg C, Motl RW, et al. Physical Activity Enjoyment Scale short form--does it fit for children? *Res Q Exerc Sport.* 2008;79(3):423-427.

25. Latorre Román P, García Pinillos F, Navarro Martínez AV, Izquierdo Rus T. Validity and reliability of Physical Activity Enjoyment Scale questionnaire (PACES) in children with asthma. *J Asthma.* 2014;51(6):633-638.

26. Godin G, Shephard RJ. A simple method to assess exercise behavior in the community. *Can J Appl Sport Sci.* 1985;10(3):141-146.

27. Sallis JF, Buono MJ, Roby JJ, Micale FG, Nelson JA. Seven-day recall and other physical activity self-reports in children and adolescents. *Med Sci Sports Exerc.* 1993;25(1):99-108.

28. Youth Risk Behavior Surveillance System. http://www.cdc.gov/healthyyouth/data/yrbs/index.htm. Accessed February 21, 2016.

29. Eaton D, Olsen E, Brener N, et al. A comparison of fruit and vegetable intake estimates from three survey question sets to estimates from 24-hour dietary recall interviews. *J Acad Nutr Diet.* 2013:113(9):1165-1174.

30. Hawaii DOE Physical Education & Activity Guidelines. 2016; http://www.hawaiipublicschools.org/TeachingAndLearning/HealthAndNutrition/WellnessGuidelines/Pages/PAS.aspx. Accessed October 6, 2016.

31. Wansink B. Nutritional gatekeepers and the 72% solution. *Journal of the American Dietetic Association.* 2006;106:1324-1327.

Table 5.1: PA Variables Descriptive

PA Variables	N	Baseline Mean (SD)	Follow-up Mean (SD)	F (df)	Sig.
PA Knowledge	19	3.05 (0.78)	3.21 (0.71)	0.58 (1)	0.45
PA stage of change	19	3.47 (1.12)	3.84 (1.01)	5.51 (1)	0.03*
PA Self-Efficacy	18	3.35 (0.91)	3.50 (0.77)	0.44 (1)	0.51
PA Enjoyment	18	4.81 (0.43)	4.75 (0.51)	0.56 (1)	0.46
MVPA min/day	19	173.68 (134.83)	294.42 (206.65)	7.44 (1)	0.01*

*** Statistically significant, p<0.05.**

Table 5.2: FV Variables Descriptive

FV Variables	N	Baseline Mean (SD)	Follow-up Mean (SD)	F (df)	Sig.
Nutrition Knowledge	19	3.84 (0.37)	3.78 (0.53)	0.32 (1)	0.58
FV Stage of Change	19	3.68 (0.94)	3.94 (0.77)	1.02 (1)	0.31
FV Self-Efficacy	17	3.20 (0.82)	3.36 (0.68)	0.63 (1)	0.44
FV Consumption	19	9.78 (3.58)	10.78 (3.75)	2.95 (1)	0.10

*** Statistically significant, p<0.05.**

CHAPTER 6: CONCLUSION

Filipino's are one of the most underrepresented ethnicities in health research and more likely to be obese compared to all other Asian ethnicities.[1,2] In Hawai'i, the majority of Filipino public high school adolescents are not meeting the FV or PA recommendations.[3,4] Studies have shown regular PA and proper FV consumption decrease the risk for chronic diseases such as obesity, cancer, heart disease and diabetes.[5,6] One approach to creating positive health behavior change in adolescents is the use of peer-led initiatives. The use of PEs in adolescent health curriculum interventions has shown positive effects in changing their peers' health SE, knowledge, and beliefs.[7 8] The objectives of this dissertation were to 1) use peer influence to increase PA and FV social cognitive and behavior variables in Filipino adolescents, 2) examine transfer and compensation effects of PA, FV consumption, and SB in Filipino adolescents, and 3) examine if PEs increase their PA and FV social cognitive and behavior variables through teaching a PA and nutrition curriculum.

Research Summary

To meet the objectives three studies were conducted. The first study, "Use of Peer Influence to Change Physical Activity and Fruit and Vegetable Social Cognitive and Behaviors in Filipino Adolescents" included 114 Filipino adolescents from WHS who participated in the HART project to see if a peer-led PA and nutrition curriculum could positively change PA and FV social cognitive and behavior variables in the participants. The multiple regression analysis for PA variables shows promise that peer-led health curriculums can change PA social cognitive and behavior variables. There was also a significant interaction found for the PA knowledge AT RISK analysis. The positive effect on PA knowledge may due to information being new and the delivery of the information through PEs. No significant interaction was found for any of the FV

consumption social cognitive and behavior variables. This is the first study to analyze Filipino adolescents considered AT RISK for PA and shows promise that a peer-led PA and nutrition curriculum is beneficial to Filipino adolescents. Future research should involve more classes at WHS outside of the health core classes.

The second study, "Multiple Health Behavior Change in Filipino Adolescents: Investigating Transfer and Compensation Effects for Fruits and Vegetables, Physical Activity, and Sedentary Behavior" examined the occurrence of transfer and compensation effects in Filipino adolescents, with specific hypotheses for each effect in relation to PA, FV consumption and SB. The main effect was neither a transfer or compensation effect for all hypotheses. The hypothesis on Low vs. High SB had a trend towards a transfer effect for those with low SB increasing their PA more than those in the high SB category. This suggests that adolescents in the low SB choose to do something else, like be PA, rather than watch TV or play video games as their free time increased over time. Parental control, social priority, and lack of time may explain the lack of significant finding for transfer and compensation effect in this population. Future research should investigate all hypotheses over a shorter time period in the same adolescent population. This study does not account for transfer and compensation that may happen over a shorter time period.

The final study "Improving Physical Activity and Fruit and Vegetable Social Cognitive and Behavior Variables in Filipino Adolescents becoming Peer Educators" included 19 Filipino senior health capstone students from WHS. PEs were trained how to teach the HART curriculum to ninth to eleventh-grade classes. The study examined if becoming a PE led to an increase in PA and FV social cognitive and behavior variables in the PEs. A significant effect was found for PA stage of change and MVPA. This is the first study to measure Filipino adolescent as PEs

quantitatively. The results from this study support previous studies that showed PEs can increase their own health social cognitive and behavior variables.[7,8] Future research should involve a control group from a health capstone class to make generalizations about PEs changing their PA and FV social cognitive and behaviors.

These studies show that a peer-led intervention can benefit participants and PEs in terms of PA social cognitive and behavior variables. Advocates of peer-led interventions believe it is successful due to PEs having similar knowledge, ability to explain concepts at appropriate level, being seen as credible sources for social information, having mutual identification and motivational support.[7,9-11] The ability of PEs to connect with fellow students in these ways also assists with the curriculum being culturally appropriate. While this study showed a peer-led intervention has benefits, there is more research needed on the mechanics and outcomes of these health behaviors in Filipino adolescents.

Future Approaches

There are several future approaches the research should investigate. One approach is the addition of objective measures for PA. The addition of accelerometers would give a better indication of intensity, frequency, duration, as well as energy expenditure. It would allow for more confidence in the effects of the PA portion of the curriculum on students beyond self-report. An inexpensive PA measure would be the addition of four field test that covers types of PA taught in lesson 1, aerobic (Cooper's 12-minute run), muscular strength (push-up test), balance (Berg Balance Scale) and flexibility (sit and reach test). This would give an assessment of the students' all around fitness, while also allowing for the incorporation of a hands-on PA lesson for the students that incorporates information already being taught and promoted throughout all eight lessons.

An approach for FV consumption is the incorporation of the food journal from the homework in lesson five. These two-day (a weekday and weekend) food journals could be used to assess quantitative and qualitative food consumption of the students. Additional days could be added for lessons 1-4 and 5-8 with a possible third journal after the intervention has completed. The third entry could give insight on the long-term effect of the nutrition portion of the HART curriculum.

Another component that could have an effect on positively changing FV social cognitive and behavior variables is the addition of a culinary component to the HART curriculum. The lack of significance found for all FV consumption variables may due to health courses already teaching this information. The HART curriculum should integrate and investigate the effect of the addition of culinary lessons focused on increasing self-efficacy and consumption through hands-on experience with FV (i.e. cutting, cooking, identifying). A similar pilot study in Latino adolescents using culinary education as part of the intervention showed improved FV social cognitive variables compared to the control group.[12]

Limitations

It should be noted there are several limitations to this study. First, the study design is quasi-experimental as the researchers were not able to randomly assign who receives the intervention. The teachers who volunteered to have their classes be a part of the study were all health curriculum classes. To improve on the design the HART curriculum could be added to homeroom classes and condense the lessons into 10-15 minute segments to be delivered each week throughout the school year by PEs. This would allow for larger dissemination of the curriculum across campus to students who are not in health curriculum courses and randomization. The branching out of the HART curriculum to possibly the local middle school

would be another approach. WHS PEs would teach the curriculum to middle school students rather than high school peers. This approach was successful in the Healthy Buddies study, where grade four through seven students served as PEs to kindergarten to third-grade students.[8]

The questionnaire is also self-report which could have led to reporting bias based on social norms by participants. Another limitation is the buy-in from the PEs teaching the curriculum. Their enthusiasm and ability to effectively deliver the lesson could influence the intervention participants' willingness to learn and engage. Future studies should investigate the PEs role in motivating students to be more PA and consume more FV. Lastly, this study is focused on Filipino adolescents, which limits its generalizability.

Sustainability

In order to sustain the advancement of the HART project at WHS, senior health capstone students should take a more active role in the leading of the project. Rather than the researchers run and train the project to the PEs, have the senior health capstone students become project coordinators (PCs) and train the eleventh-grade health students as PEs. This approach would allow the project to continue on at WHS, continue the peer-to-peer development of the students (12^{th} graders to 11^{th} graders, 11^{th} graders to 9^{th} and 10^{th} graders), help senior students gain leadership skills and allow researchers to branch out to different communities/schools.

Potential School-Wide Policy Implementation

Manuscript one showed a significant change in PA knowledge score between AT RISK groups from baseline to follow-up. (Chapter 3) This shows that the HART curriculum is adding to the current health knowledge of students who are not meeting the recommended amount of PA at WHS. Currently, the Hawai‘i DOE only requires High School students to take 1.0 credit of physical education for graduation and gives daily 20-minute recess breaks during which students

are only encouraged to be moderate to vigorously active.[13] With only 20% of Hawai‘i Public High School Students meeting PA guidelines[4] and 28% not having a healthy body weight[14] a better policy should be implemented to help create and foster behavior change. The addition of required credits for PE or possibly strengthening the PA portion in health courses could lead to greater change in PA in Hawai‘i public high school students and aid in the prevention of chronic disease into adulthood.

Conclusion

Even with limited findings, this is one of the first studies to analyze longitudinally a peer-led PA and nutrition curriculum on changing social cognitive and behavior variables, analyze MHBC, and quantitatively analyze health behavior change in Filipino adolescents acting as PEs. More research is needed focusing on changing PA and FV consumption health behaviors in minority adolescents, especially Filipino, Hawaiian and OPI. These ethnicities groups have some of the highest rates of obesity and chronic disease.[1,15,16] Given the current limited research on Filipino adolescents' health behaviors, this dissertation adds to the literature and gives guidance for future research with this population.

References

1. Joyce J, Lynne H, Fernando M. Filipino Child Health in the United States: Do Health and Health Care Disparities Exist? *Preventing Chronic Disease.* 2007;4(2):20. https://www.cdc.gov/pcd/issues/2007/apr/06_0069.htm.

2. Obesity and Asian Americans. 2015; http://minorityhealth.hhs.gov/omh/browse.aspx?lvl=4&lvlID=55. Accessed May 2016.

3. PAN Plan Target Teen Fruit and Vegetable Consumption. 2015; http://www.hawaiihealthmatters.org/modules.php?op=modload&name=NS-Indicator&file=indicator&indid=3000263000407&iid=11662171, 2016.

4. Teens Who Meet Aerobic Physical Activity Guidelines 2015. 2015; http://www.hawaiihealthmatters.org/modules.php?op=modload&name=NS-Indicator&file=indicator&indid=3000523000407&iid=11651993, 2016.

5. Lowry R, Michael S, Demissie Z, Kann L, Galuska DA. Associations of Physical Activity and Sedentary Behaviors with Dietary Behaviors among US High School Students. *J Obes.* 2015;2015:876524.

6. Prochaska JJ, Sallis JF. A randomized controlled trial of single versus multiple health behavior change: promoting physical activity and nutrition among adolescents. *Health Psychol.* 2004;23(3):314-318.

7. Story M, Lytle LA, Birnbaum AS, Perry CL. Peer-led, school-based nutrition education for young adolescents: feasibility and process evaluation of the TEENS study. *J Sch Health.* 2002;72(3):121-127.

8. Stock S, Miranda C, Evans S, et al. Healthy Buddies: a novel, peer-led health promotion program for the prevention of obesity and eating disorders in children in elementary school. *Pediatrics.* 2007;120(4):e1059-1068.

9. Bell S, Audrey S, Cooper A, Noble S, Campbell R. Lessons from a peer-led obesity prevention program in English schools. *Health Promotion International.* 2014:1-11.

10. Lockspeiser TM, O'Sullivan P, Teherani A, Muller J. Understanding the experience of being taught by peers: the value of social and cognitive congruence. *Adv Health Sci Educ Theory Pract.* 2008;13(3):361-372.

11. Ginis KA, Nigg CR, Smith AL. Peer-delivered physical activity interventions: an overlooked opportunity for physical activity promotion. *Transl Behav Med.* 2013;3(4):434-443.

12. Gatto NM, Ventura EE, Cook LT, Gyllenhammer LE, Davis JN. LA Sprouts: a garden-based nutrition intervention pilot program influences motivation and preferences for fruits and vegetables in Latino youth. *J Acad Nutr Diet.* 2012;112(6):913-920.

13. Hawaii DOE Physical Education & Activity Guidelines. 2016; http://www.hawaiipublicschools.org/TeachingAndLearning/HealthAndNutrition/WellnessGuidelines/Pages/PAS.aspx. Accessed October 6, 2016.

14. Hawaii Health Matters: Teens with a Healthy Body Weight. 2016; http://www.hawaiihealthmatters.org/index.php?module=indicators&controller=index&action=view&indicatorId=1321&localeId=14. Accessed October 6, 2016.

15. Community Dashboard: Teens who are Overweight. 2015; Hawaii by Race/Ethnicity for Health Behaviors. Available at: http://www.hawaiihealthmatters.org/modules.php?op=modload&name=NS-Indicator&file=indicator&iid=11662182&Submit=Go, 2016.

16. Hawaii Health Matters: Teens who are Obese. 2015; http://www.hawaiihealthmatters.org/index.php?module=indicators&controller=index&action=view&indicatorId=1312&localeId=14. Accessed September 2, 2016.

APPENDIX

LIST OF APPENDICES

APPENDIX A: Literature Review

Table 1: Literature Review SCT in Asian Adolescent Populations

Reference	Theory	Population (N sex, age, Ethnicity, location)	Study Design	Intervention Channel (peer, internet, teacher, health care, study staff	Intervention Content (improving SE, SS, Role-modeling, environment change)	Methods for Outcomes:				Results
						Physical Activity	Nutrition	SB	Mediators	
1	SCT	N=70,000, age=7-18, Chinese	Longitudinal, randomized control trial (Rational only)	School based and family involved intervention	1) Create supportive and school environment, 2) Healthy lifestyles education and related PA 3) Instruct and promote school physical education 4) Self-monitor obesity related behaviors	Standing-board jump, 50-meter speed run, 50-meter x 8 shuttle run, and run 800/1000 meters, PA log	Dietary behavior log,		SE through parental feedback, behavioral outcomes through children questionnaire	1st & largest multi-centered school based obesity intervention program of Chinese children & adolescent. Use lessons learned & results help guide future school-based national childhood obesity prevention program in mainland China.
2	SCT	N=10 (female = 3), mean age=14, Korean American (KA) adolescents	Evaluation	Facebook	Culturally tailored learning module on healthy eating and PA	US PA guidelines	Interview dietary habits, USDA, Korea Ministry of Health & Welfare dietary guidelines			Evaluation showed that Healthy Teens program is usable for KA adolescents.

5	SCT	N=506 (female=50.6%, AA= 8%), age=10-14, Mid-west US	Cross-sectional	Questionnaire and physical assessment	Evaluated SCT variables and perceptions of school environment to predict PA and fitness in middle school children	Youth PA self-efficacy scale, Proxy Efficacy for PA scale (PEPA), Godin Leisure-Time Exercise Questionnaire (GLTEQ) (all self-report)		Friend subscale for classmate social support (self-report)	Multiple regression found barrier SE (B= .167, p=0.00) & classmate SS (B=. 134, p= .00) for PA most critical variables. One of first studies to show importance of peer-influence from classmates promoting PA.
6	SCT peer-led	N=2883 (Asian or Pacific Islander n=185), grade=7th-8th, Twin Cities, Minnesota	Longitudinal, group randomized trial	Nutrition curriculum, family education, peer-led lessons	Self-monitoring, goal setting, hands-on snack preparation, skill development for choosing healthy foods & overcoming barriers to healthful choices		24-hour recall, FV screener from BRFSS (self-report), Food choice scale (self-report)		Food-choice score significant between the intervention (M=6.15) & control (M=1.70) at follow-up (CI=0.038-0.713). There was no significant difference between treatment groups for all other end points.
4	SCT	N=832, Taiwanese adolescents	Cross-sectional	Examine relationship among interpersonal influences (social support, norms, modeling), behavior specific cognitions (self-efficacy, perceived benefits/barriers), competing demands, and PA		Child Adolescent Activity Log (CAAL)(self-report)			Perceived SE most important predictor of PA, interpersonal influence weak effect but had indirect effects on PA through perceived benefits & SE. Parental influences did not have direct effect on PA, peers did have a significant effect on PA & indirect influence on PA through self-efficacy. Together all variables accounted for 30% of variance in PA.

3	SCT	N=671 (female=48%), age= 13-18 (M=15.8), grades 7th-11th, Seoul, Korea	Cross-sectional	PA self-efficacy, PA benefits, and PA barriers	Stage of Exercise Change Questionnaire (translated to Korean)	Exercise behavior distribution between gender (x2= 113.14, df=4, p<0.001) & age (x2=150.72, df=4, p<0.001). SE & decision balance by stage of exercise showed SE differentiated adolescents at different stages (F=10.49, p<0.001), significant differences emerged across stages for exercise benefits (F=4.99, p<.01) & exercise barriers (F=2.68, p<0.05). All psychological variables correlated with exercise behavior (r=.35 (SE), .27 (exercise benefits), -.19 (exercise barriers), p<0.01). Regression analysis SE (B=.34) strongest effect on exercise behavior, while exercise benefits (B=.29) & exercise barriers (B=-.19) also had significance (p<0.01)

Literature Review Inclusion Criteria: Studies based on the SCT and having matching or similar adolescent population (Filipino/Asian, ages 10-19, high school, 9th graders – 12th graders), intervention component (PA and/or nutrition curriculum, peer-led), or outcome assessments (questionnaire, short FV food frequency questionnaire, PA, stage of change for FV or PA, self-efficacy for PA or FV, nutrition knowledge, PA knowledge, PA social support, PA enjoyment, and sedentary behavior (SB))

Table 2: Literature Review MHBC in Asian Adolescents

Reference	Theory	Population (N, sex, age, Ethnicity, location)	Study Design	Intervention Channel (peer, internet, teacher, health care, study staff	Intervention Content (improving SE, SS, Role-modeling, environment change)	Methods for Outcomes:				Results
						Physical Activity	Nutrition	SB	Mediators	
31	MHBC	N=8360 (50% female, 17% Asian), Middle school, Southern California	Longitudinal	CHOICE an after school substance abuse program	Assess if association among health behaviors could be explained by underlying health risk	California Healthy Kids Survey and YRBSS (self-report)	Two items measured frequency of intake of low-nutrient, energy dense foods (self-report)	Sedentary screen based activities (self-report)		Measured behavior explained by 'unhealthy eating and sedentary factor'. PA dropped from model since it did not relate to underlying risk factor as expected. Composite reliability method revealed no statistical significant difference in reliability for unhealthy eating and sedentary factor over time.
32	MHBC	Adolescent and young adult survivors of childhood cancer (AYASCC) N=15054 (AYASCC Hawai'i Asian n=11) (Hawai'i n=1,191, US n=13,840)	Cross-sectional	YRBSS Questionnaire	Bridge gap about AAPI AYASCC in Hawai'i, specifically see if have higher prevalence of adverse health behaviors than similar age samples from Hawai'i and across US	YRBSS (telephone interview)	YRBSS (telephone interview)			More AYASCC adolescent survivors met recommended MVPA guidelines over a 5-day period compared to Hawai'i and US adolescents ($p<.001$) and ate less of the recommended 5 servings of FV per day than Hawai'i and US adolescents ($p<.001$).

30	MHBC	N=783, age 12-13, female=51%, Vietnamese Adolescents, California	Cross-sectional	YRBSS Questionnaire	Examine prevalence of unhealthy behaviors among cohort of Vietnamese adolescents in California		YRBSS (telephone interview)	YRBSS (telephone interview)	Female significantly more sedentary that males (p<.001), overall females and males (44.1%) ate <5 servings of FV, but was not significantly different between gender.
33	MHBC	N=5665 (female= 50.6%, Asian=3.6%, Hawaiian/Pacific Islander= 0.5%) mean age = 12.8 yrs., grade = 6th-8th	Longitudinal	School multi-disciplinary team to implement obesity prevention curriculum	Multi-component intervention improve students' dietary, PA behaviors & weight status. Activities promoted 5-2-1 theme	YRBSS (self-report)	YRBSS (self-report)	YRBSS (self-report)	Behavior change over 3 years increased significantly for FV consumption 2.8 to 3.0 times daily (p=0.0001), TV decreased from 2.2 to 2.1 hours daily (p=0.008), and PA for ≥ 60 mins. Increased 3.7 to 3.8 days per week (p=0.02)
29	MHBC	N=138 (AAPI=32), mean age =12.1 (SD=0.9), San Diego, CA	Longitudinal	Individualized behavior change were created based on PACE+	Compare interventions targeting PA & nutrition (PAN) vs. PA alone	Accelerometer	FV consumption 3-day food record (self-report)		PA intervention significantly different from control (p=0.013, d=0.96), no significant differences between two intervention conditions (p=0.395, d=0.23). FV consumption boys decreased (M= -0.38, SD=1.06) svgs/day for PAN & increased for PA only (m=0.18, SD=1.64) & control (M-0.71, SD=0.90) while girls increased (M=0.13, SD=1.32) svgs/day for PAN, (M=0.09, SD=2.12) for PA & decreased by (M=-0.43, SD=1.84) for the control group.

34	MHBC	N=885 (AAPI=128), grade = 9th-12th, Rhode Island, Massachusetts, New York, and Tennessee	Longitudinal	A computer tailored multiple behavior intervention for adolescents	Increasing PA & FV consumption and decreasing SB	Amount PA, PA stage of change (YRBSS)(self-report)	FV consumption amount & stage of change (YRBSS) (self-report)	Amount of TV viewing, TV viewing stage of change (self-report)	2x4 factorial repeated measures compared treatment and control groups at 0, 2, 6, & 12 months. Treatment greater amount of days doing at least 60 minutes of PA at 2 months (3.38 vs. 2.72), treatment reported significantly ($p< 0.001$) more servings of FV at 2 (3.86 vs. 3.0), 6(3.55 vs. 2.73), & 12 (3.67 vs. 2.97) months than control. SB for limited TV viewing was not significantly different.

Literature Review Inclusion Criteria: Studies based on MHBC and having matching or similar adolescent population (Filipino/Asian, ages 10-19, high school, 9^{th} graders – 12^{th} graders), intervention component (PA and/or nutrition curriculum, peer-led), or outcome assessments (questionnaire, short FV food frequency questionnaire, PA, stage of change for FV or PA, self-efficacy for PA or FV, nutrition knowledge, PA knowledge, PA social support, PA enjoyment, and sedentary behavior (SB))

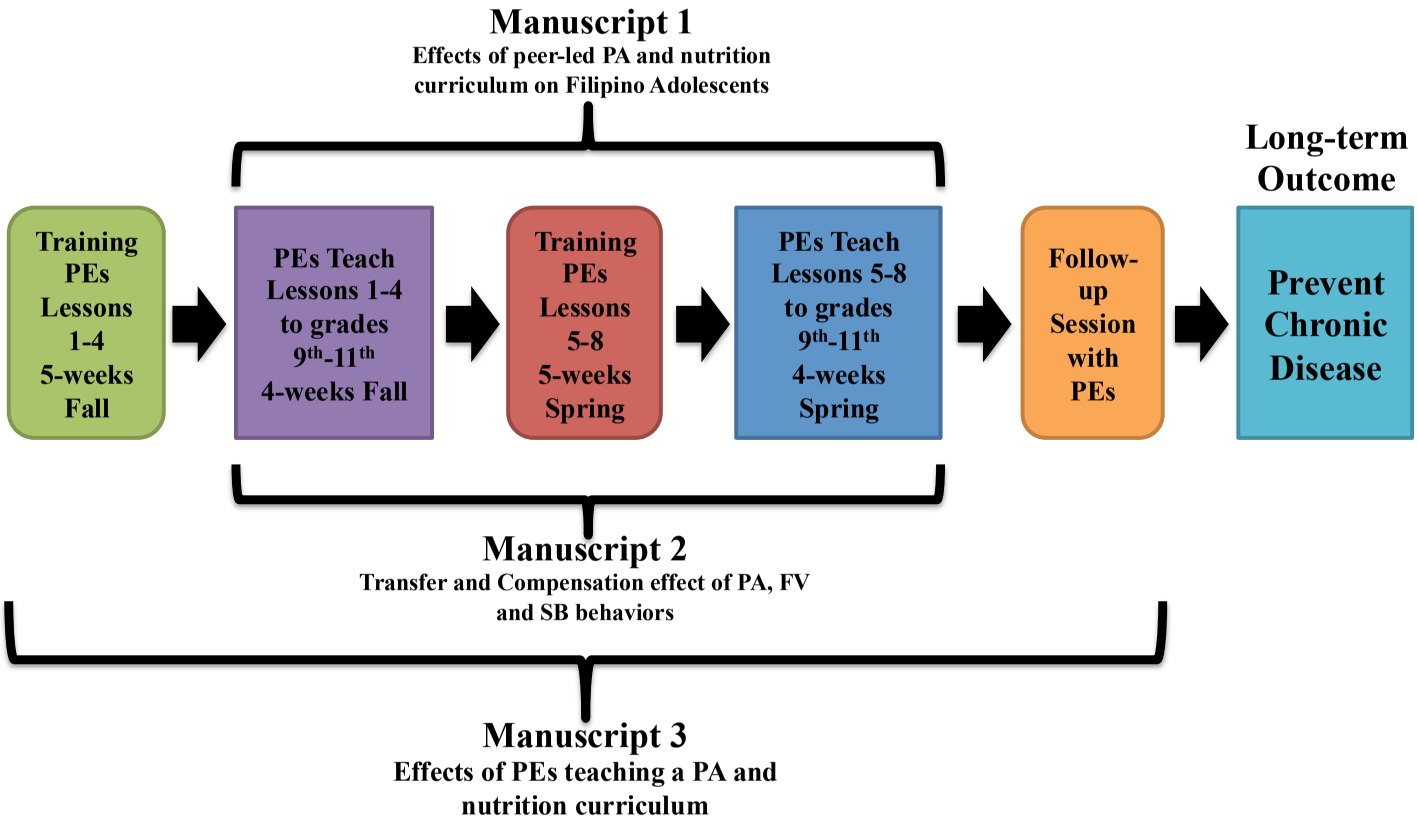
Table 3: Literature Review of Asian Adolescents as Peer Health Educators

Reference	Theory	Population (N sex, age, Ethnicity, location)	Study Design	Intervention Channel (peer, internet, teacher, health care, study staff	Intervention Content (improving SE, SS, Role-modeling, environment change)	Methods for Outcomes:				Results
						Physical Activity	Nutrition	SB	Mediators	
41	Adolescents' as Health Educators	N=226 (Asian n=21), mean age=12.7, grade=7th, Twin Cities, Minnesota	Longitudinal	Students as educators	Assist teaching nutrition curriculum		Process Evaluation (self-report, observation, teacher perceptions)			90% enjoyed being peer-leaders, and 85% thought they learned more about healthy eating, 64.3% thought they ate more healthful due to being a peer-leader. Peer-led nutrition curriculum is feasible, has good acceptability among peer leaders, students, and teachers.

Literature Review Inclusion Criteria: Studies based on adolescent peer health educators and having matching or similar adolescent population (Filipino/Asian, ages 10-19, high school, 9th graders – 12th graders), intervention component (PA and/or nutrition curriculum, peer-led), or outcome assessments (questionnaire, short FV food frequency questionnaire, PA, stage of change for FV or PA, self-efficacy for PA or FV, nutrition knowledge, PA knowledge, PA social support, PA enjoyment, and sedentary behavior (SB))

APPENDIX B: Waipahu HART time frame for three manuscripts

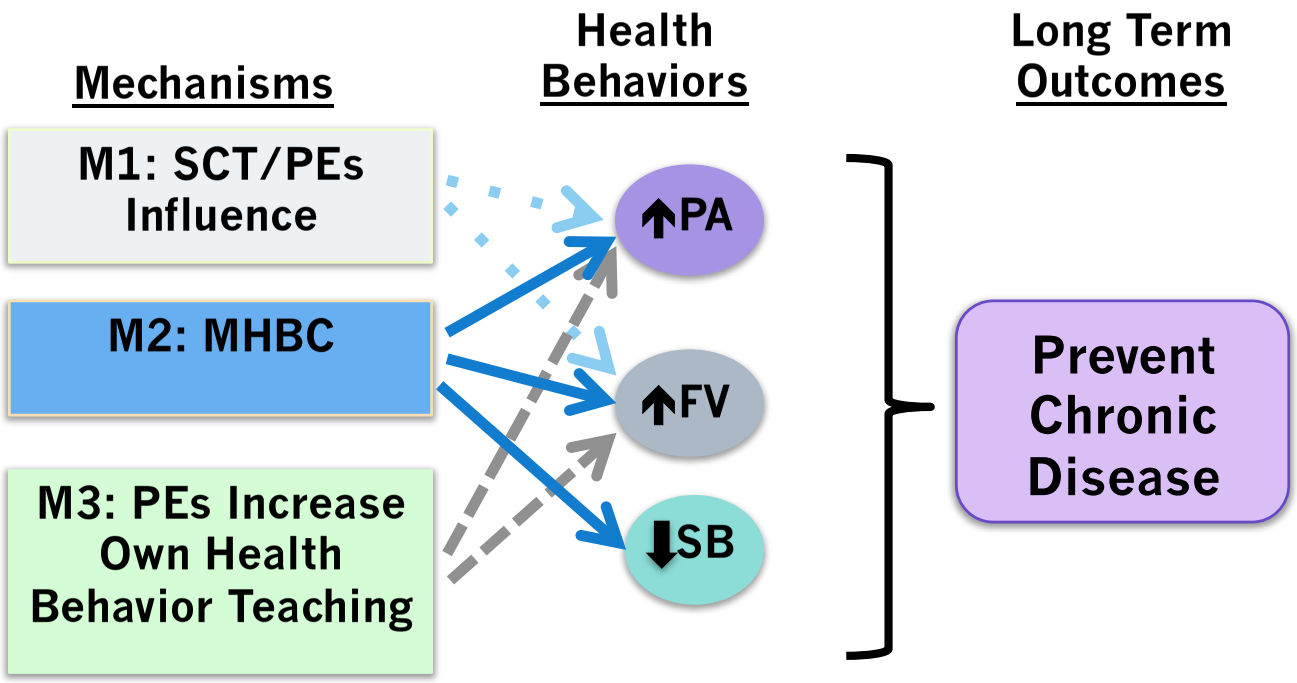
Figure 1: HART time frame for three manuscripts on Filipino Adolescents social cognitive and behavior variables.



Assessment tool: HART PA and Nutrition Questionnaire

APPENDIX C: Conceptual framework

Figure 2: Conceptual framework for three manuscripts.



M1: Manuscript 1, M2: Manuscript 2, M3: Manuscript

APPENDIX D: Parental Consent Form

PARENTAL CONSENT FORM GRADES 9 - 11

Dear Parent,

My name is Claudio Nigg. I am a researcher at the University of Hawaii. My work is about teenage health behaviors. My study is looking at a peer-led physical activity and nutrition program at your child's high school. The program is part of your child's normal school work. It is an 8-week program.

I am asking for you to OK that your child takes part in surveys and some sharing. I also will ask your child if s/he is OK to do this.

❖ **Tasks and Time it Takes**
If your child is OK to do the survey and sharing s/he will be asked to do the following:

1) **Activity 1:** At the start of the program your child will be asked to do a brief survey. The survey is about physical activity and nutrition. The survey also asks about gender, age and ethnicity. Researchers will also take notes during the class (Estimated time: 45 minutes).

2) **Activity 2:** At the end of the program we will ask your child and their peers to share what they think about this topic. Your child will be asked to do the brief survey again. (Estimated time: 45 minutes).

❖ **Benefits and Risks:** I think there are no direct benefits to your child for doing the survey or the sharing. But this survey may help me, other teachers, and researchers learn more about high school student's physical activity and nutrition. I think there is little or no risk to your child doing the surveys or sharing. But if your child becomes uneasy or stressed by doing the surveys or sharing s/he can skip questions, take a break, go to the school counselors, or quit the survey/sharing altogether**.**

❖ **Confidentiality and Privacy**: I will keep all survey data in a safe place. Only my University of Hawaii staff and I will use the data. No one from the school will be able to look at individual survey or sharing data. Student's data is coded with ID numbers which we give. The students name will be kept apart from the data. This will keep the data of all students fully private. We only present group results. The results may be presented at meetings, reports, or in papers.

❖ **Voluntary Participation:** Your child (and you) can choose freely to take part or not to take part in the surveys and sharing. Also, you or your child can stop at any time during the surveys or sharing. Stop doing the surveys or sharing does not affect her/his grades, or teacher-to-student link at Waipahu High School. If you choose not to allow your student to take part, s/he will not be asked to do any surveys or sharing. But the teacher may assign things for them to do during this time.

❖ **Questions?**
If you have any questions or concerns please call Dr. Claudio Nigg at 808-956-2862 (cnigg@hawaii.edu). You may also contact the University of Hawai'i Human Studies Program at 808-956-5007 (uhirb@hawaii.edu).

Tear or cut here

Signature(s) for Consent:

It is OK for my child to do the surveys and sharing. I understand that my child must also be OK with it before doing the survey and sharing. I understand that my child and/or I can change our minds about doing the surveys and sharing at any time. We just tell the researcher that we do not want to do the surveys and sharing anymore.

Name of Child (Print): _____

Name of Parent/Guardian (Print): _____

Parent/Guardian's Signature: _____

Date: _____

PARENTAL CONSENT FORM PEER EDUCATORS

Dear Parent,

My name is Claudio Nigg. I am a researcher at the University of Hawaii. My work is about teenage health behaviors. My study is looking at a peer-led physical activity and nutrition program at your child's high school. The program is part of your child's normal school work. It is a 13-week program.

I am asking for you to OK that your child takes part in surveys and some sharing. I also will ask your child if s/he is OK to do this.

❖ **Tasks and Time it Takes**

If your child is OK to do the surveys and sharing s/he will be asked to do the following:

3) **Activity 1:** At the start of the program your child will be asked to do a brief survey about research (Time it takes: about 10 minutes).

4) **Activity 2:** At the 2nd class, your child will be asked to do a brief survey. The survey there is about physical activity and nutrition. The survey also asks about gender, age and ethnicity (Time it takes: about 20 minutes).

5) **Activity 3:** At the end of the program your student and their peers to share what they think about this topic. Your child will be asked to do the research survey. Your child will also be asked to do the physical activity and nutrition survey. (Time it takes: about 50 minutes).

❖ **Benefits and Risks:** I think there are no direct benefits to your child for doing the surveys or sharing. But this survey may help me, other teachers, and researchers learn more about high school student's physical activity and nutrition. I think there is little or no risk to your child doing the surveys or sharing. But if your child becomes uneasy or stressed by doing the surveys or sharing s/he can skip questions, take a break, go to the school counselors, or quit the survey/sharing altogether**.**

❖ **Confidentiality and Privacy**: I will keep all survey data in a safe place. Only my University of Hawaii staff and I will use the data. No one from the school will be able to look at individual survey or sharing data. Student's data is coded with ID numbers which we give. The students name will be kept apart from the data. This will keep the data of all students fully private. We only present group results. The results may be presented at meetings, reports, or in papers.

❖ **Voluntary Participation:** Your child (and you) can choose freely to take part or not to take part in the surveys and sharing. Also, you or your child can stop at any time during the surveys or sharing. Stop doing the surveys or sharing does not affect her/his grades, or teacher-to-student link at Waipahu High School. If you choose not to allow your student to take part, s/he will not be asked to do any surveys or sharing. But the teacher may assign things for them to do during this time.

❖ **Questions?**

If you have any questions or concerns please call Dr. Claudio Nigg at 808-956-2862 (cnigg@hawaii.edu). You may also contact the University of Hawai'i Human Studies Program at 808-956-5007 (uhirb@hawaii.edu).

Tear or cut here

Signature(s) for Consent:

It is OK for my child to do the surveys and sharing. I understand that my child must also be OK with it before doing the survey and sharing. I understand that my child and/or I can change our minds about doing the surveys and sharing at any time. We just tell the researcher that we do not want to do the surveys and sharing anymore.

Name of Child (Print): _____

Name of Parent/Guardian (Print): _____

Parent/Guardian's Signature: _____

Date: _____

APPENDIX E: Student Assent Forms

STUDENT ASSENT FORM GRADE 9 - 11

Dear Student,

My name is Claudio Nigg. I am a researcher at the University of Hawaii. My work is about teenage health behaviors. My study is looking at a peer-led physical activity and nutrition program at your high school. The program is part of your normal school work. It is an 8-week program.

I am asking if it is OK with you to take part in surveys and some sharing.. Please read the information below before giving your OK or not.

❖ **Tasks and Time it Takes**
If you are OK to do the survey and sharing you will be asked to do the following:

6) **Activity 1:** At the start of the program you will be asked to do a brief survey. The survey is about physical activity and nutrition. The survey also asks about gender, age and ethnicity. Researchers will also take notes during the class (Estimated time: 45 minutes).

7) **Activity 2:** At the end of the program we will ask you and your peers to share what you think about this topic. You will be asked to do the brief survey again. (Estimated time: 45 minutes).

❖ **Benefits and Risks:** I think there are no direct benefits to you for doing this survey or sharing. But this survey may help me, other teachers, and researchers learn more about high school student's physical activity and nutrition. I think there is little or no risk to you doing the surveys or sharing. But if you become uneasy or stressed by doing the surveys or sharing you can skip questions, take a break, go to the school counselors, or quit the survey/sharing altogether**.**

❖ **Confidentiality and Privacy**: I will keep all survey data in a safe place. Only my University of Hawaii staff and I will use the data. No one from the school will be able to look at individual survey or sharing data. Your data is coded with ID numbers which we give. Your name will be kept apart from the data. This will keep the data fully private. We only present group results. The results may be presented at meetings, reports, or in papers

❖ **Voluntary Participation:** You can choose freely to take part or not to take part in the surveys and sharing. Also, you can stop at any time during the surveys or sharing. Stop doing the surveys or sharing does not affect your grades, or teacher-to-student link at Waipahu High School. If you choose not to take part, you will not be asked to do any surveys or sharing. But the teacher may assign things for you to do during this time.

❖ **Questions?**
If you have any questions or concerns please call Dr. Claudio Nigg at 808-956-2862 (cnigg@hawaii.edu). You may also contact the University of Hawai'i Human Studies Program at 808-956-5007 (uhirb@hawaii.edu).

Tear or cut here

Signature(s) for Assent:

I am OK to do the surveys and sharing. I understand that I can change my mind about doing the surveys and sharing at any time. I just tell the researcher that I do not want to do the surveys and sharing anymore.

Name: _____

Signature: _____

Date: _____

STUDENT ASSENT FORM PEER EDUCATOR

Dear Student,

My name is Claudio Nigg. I am a researcher at the University of Hawaii. My work is about teenage health behaviors. My study is looking at a peer-led physical activity and nutrition program at your high school. The program is part of your normal school work. It is an 8-week program.

I am asking if it is OK with you to take part in surveys and some sharing. Please read the information below before giving your OK or not.

❖ **Tasks and Time it Takes**

If you are OK to do the surveys and sharing you will be asked to do the following:

8) **Activity 1:** At the start of the program you will be asked to do a brief survey about research (Time it takes: about 10 minutes).

9) **Activity 2:** At the 2nd class you will be asked to do a brief survey. The survey is about physical activity and nutrition. The survey also asks about gender, age and ethnicity (Time it takes: about 20 minutes).

10) **Activity 3:** At the end of the program we will ask you and your peers to share what you think about this topic. You will be asked to do the research survey again. You will also be asked to do the physical activity and nutrition survey. (Time it takes: about 50 minutes).

❖ **Benefits and Risks:** I think there are no direct benefits to you for doing the surveys or sharing. But these surveys may help me, other teachers, and researchers learn more about high school student's physical activity and nutrition. I think there is little or no risk to you doing the surveys or sharing. But if you become uneasy or stressed by doing the surveys or sharing you can skip questions, take a break, go to the school counselors, or quit the survey/sharing altogether**.**

❖ **Confidentiality and Privacy**: I will keep all survey data in a safe place. Only my University of Hawaii staff and I will use the data. No one from the school will be able to look at individual survey or sharing data. Your data is coded with ID numbers which we give. Your name will be kept apart from the data. This will keep the data fully private. We only present group results. The results may be presented at meetings, reports, or in papers.

❖ **Voluntary Participation:** You can choose freely to take part or not to take part in the surveys and sharing. Also, you can stop at any time during the surveys or sharing. Stop doing the surveys or sharing does not affect your grades, or teacher-to-student link at Waipahu High School. If you choose not to take part, you will not be asked to do any surveys or sharing. But the teacher may assign things for you to do during this time.

❖ **Questions?**

If you have any questions or concerns please call Dr. Claudio Nigg at 808-956-2862 (cnigg@hawaii.edu). You may also contact the University of Hawai'i Human Studies Program at 808-956-5007 (uhirb@hawaii.edu).

Tear or cut here

Signature(s) for Assent:

I am OK to do the surveys and sharing.” I understand that I can change my mind about doing the surveys and sharing at any time. I just tell the researcher that I do not want to do the surveys and sharing anymore.

Name: _____

Signature: _____

Date: _____

APPENDIX F: Adult Participant Consent Form

Dear Student,

My name is Claudio Nigg. I am a researcher at the University of Hawaii. My work is about teenage health behaviors. My study is looking at a peer-led physical activity and nutrition program at your high school. The program is part of your normal school work. It is an 8-week program.

I am asking if it is OK with you to take part in surveys and some sharing. Please read the information below before giving your OK or not.

❖ **Tasks and Time it Takes**

If you are OK to do the surveys and sharing you will be asked to do the following:

11) **Activity 1:** At the start of the program you will be asked to do a brief survey about research (Time it takes: about 10 minutes).

12) **Activity 2:** At the 2nd class you will be asked to do a brief survey. The survey is about physical activity and nutrition. The survey also asks about gender, age and ethnicity (Time it takes: about 20 minutes).

13) **Activity 3:** At the end of the program we will ask you and your peers to share what you think about this topic. You will be asked to do the research survey again. You will also be asked to do the physical activity and nutrition survey. (Time it takes: about 50 minutes).

❖ **Benefits and Risks:** I think there are no direct benefits to you for doing the surveys and sharing. But these surveys may help me, other teachers, and researchers learn more about high school student's physical activity and nutrition. I think there is little or no risk to you doing the surveys or sharing. But if you become uneasy or stressed by doing the surveys or sharing you can skip questions, take a break, go to the school counselors, or quit the survey/sharing altogether**.**

❖ **Confidentiality and Privacy**: I will keep all survey data in a safe place. Only my University of Hawaii staff and I will use the data. No one from the school will be able to look at individual survey or sharing data. Your data is coded with ID numbers which we give. Your name will be kept apart from the data. This will keep the data fully private. We only present group results. The results may be presented at meetings, reports, or in papers.

❖ **Voluntary Participation:** You can choose freely to take part or not to take part in the surveys and sharing. Also, you can stop at any time during the surveys or sharing. Stop doing the surveys or sharing does not affect your grades, or teacher-to-student link at Waipahu High School. If you choose not to take part, you will not be asked to do any surveys or sharing. But the teacher may assign things for you to do during this time.

❖ **Questions?**
If you have any questions or concerns please call Dr. Claudio Nigg at 808-956-2862 (cnigg@hawaii.edu). You may also contact the University of Hawai'i Human Studies Program at 808-956-5007 (uhirb@hawaii.edu).

Tear or cut here

Signature(s) for Consent:

I am OK to do the surveys and sharing. I understand that I can change my mind about doing the surveys and sharing at any time. I just tell the researcher that I do not want to do the surveys and sharing anymore.

Name: _____

Signature: _____

Date: _____

APPENDIX G: Hawai‘i Department of Education Data Sharing Agreement Form

Data Sharing Agreement
Between
Office of Public Health Studies at the University of Hawaii at Manoa
and
Waipahu High School

This data sharing agreement allows Waipahu High School (WHS) to share individual student or staff data and/or personally identifiable student information (hereafter "PII") from education records to Office of Public Health Studies at the University of Hawaii at Manoa (OPHS) for purposes as outlined in this agreement, which authorizes OPHS access to those data in accordance with Family Educational Rights and Privacy Act (FERPA), 34 CFR §99.31(a)(6)(i) in order to conduct a study or evaluation on behalf of WHS. Disclosing data/information from education records to OPHS in no way assigns OPHS ownership of the data/information or records, and therefore, the data/information and/or records may be redisclosed only with written permission by the WHS Principal or otherwise in compliance with FERPA and its regulations.

Attached to this data sharing agreement is a detailed work plan detailing the Waipahu Health Action Research Training (HART) project; other related documents will be kept on file at the Hawaii Department of Education Data Governance and Analysis Branch for reference, review and in the course of an audit. If this data sharing agreement is related to an authorized research project or grant in the Hawaii Department of Education (DOE), documentation that OPHS research staff named in this agreement have completed the FERPA 101 Course online, available at http://ptac.ed.gov, will also be kept on file at the DOE.

1. Start Date: Upon full execution of this agreement

2. End Date: 1 year from start date of this agreement. This agreement may be renewed annually until the end date of the project, upon mutual agreement by the DOE and OPHS.

3. Names and positions of non-DOE personnel authorized to access the data:

Claudio Nigg, Professor and PI

Michelle Rathke, Graduate Research Assistant

Individual Staff may change over the course of the project, therefore, the Requestor will be required to inform the DOE of the change in staff via memo and retain a current list of staff in the event of an audit. Upon entering into the project, a new staff member will be required to adhere to the confidentiality requirements as set forth in this data sharing agreement and related MOU.

4. Specific data requested:

   The following data will be released only upon verification of parent, guardian and/or eligible student consent, unless those data are being released in order for OPHS to conduct a study or evaluation on behalf of WHS as allowable under FERPA.

   a. Gender
   b. Height
   c. Weight
   d. Age
   e. Ethnicity
   f. Physical activity behavior
   g. Physical activity self-efficacy
   h. Physical activity attitude
   i. Physical activity stage of change
   j. Social support
   k. Physical activity and nutrition knowledge
   l. Sedentary behavior
   m. Nutrition behavior
   n. Nutrition stage of change
   o. Nutrition self-efficacy
   p. Research knowledge

   The HART Physical Activity and Nutrition Questionnaire and the HART Research Knowledge Questionnaire will be used to collect the above data.

5. Limitations to the use and release of the data:

OPHS is authorized by way of this agreement to access the specified data and use said data only to meet the purpose of this agreement with WHS. If the data, as a whole, that are presented to OPHS contain PII, the entire data set is considered PII and should be handled as such, and is protected under FERPA and this agreement. DOE maintains the right to conduct audits or other monitoring activities of OPHS policies, procedures and systems. In the event that a violation occurs, the named PI of OPHS will be ineligible to receive PII data for not less than five years. DOE also reserves the right to pursue legal redress related to the violation. DOE has final decision-making authority for all disputes related to this agreement. In the event the agreement is terminated, all data and information derived by the data will be destroyed upon notification of the termination and the authorized representative shall send written verification of the destruction to DOE.

6. Data destruction protocols employed by OPHS:
   OPHS agrees to destroy the data within 30 days from the end date of this agreement. This requirement does not apply to signed consent forms, which, in accordance with 45 CFR §46.115(b) "IRB Records," may be retained for three years from the end date of the project.

7. Data protection plan:
   All data from the project will be kept in a secure location. Only the University of Hawaii research staff will have access to the data. No school representatives will be able to view individual research information for students. Student's information is coded with identification numbers provided by project staff. This will keep the identity of all students cofidential. Results will only be presented in group form and no individual data will be presented.

8. Description of disciplinary policy for FERPA violation: OPHS will fully comply with FERPA by protecting the privacy of student records and the confidentiality of all data in our possession. Should an unintentional violation arise, OPHS will report it immediately to DOE and take the necessary steps to come into compliance as well as deal with violators within OPHS's applicable personnel policies and procedures. In the event the requestor learns of a security breach involving data/information, the Requestor must report it immediately to the DOE as outlined in the guidance document, "Guidelines for Notification of Security Breaches of Personal Information," so that breach notification can occur as required by

Hawaii Revised Statute 487N. Any breach is the responsibility and liability of the authorized representative, by signing this agreement, agrees to indemnify and defend the DOE should the DOE be found liable as a result of the breach. OPHS will provide the DOE with a copy of the study results or final report of the study prior to publication for review to ensure that no PII is contained with the document.

We, the undersigned, agree to adhere to the terms and conditions specified above.

State of Hawaii	University of Hawaii at Manoa
Department of Education	Office of Public Health Studies
_____	_____
Keith Hayashi	Kathryn Braun
Principal, Waipahu High School	Director
Date _____	Date _____

APPENDIX H: Institutional Review Board Approval Form

Office of Research Compliance
Human Studies Program

UNIVERSITY of HAWAI'I' MĀNOA

MEMORANDUM

October 27, 2014

TO: Claudio Nigg, Ph.D.
Principal Investigator
Public Health

FROM: Denise A. Lin-DeShetler, MPH, MA
Director

SUBJECT: CHS # 22409, "Waipahu HART Project"

This is to acknowledge receipt of your response dated October 27, 2014 to the stipulations issued by the Human Studies Program during its review of the project identified above at its meeting on September 19, 2014. The information you provided satisfactorily addressed the Human Studies Program stipulations, and the project is approved for one year, effective October 27, 2014.

This memorandum is your record of the Human Studies Program approval of this study. Please maintain it with your study records.

The Human Studies Program approval for this project will expire on October 26, 2015. If you expect your project to continue beyond this date, you must submit an application for renewal of this Human Studies Program approval. The Human Studies Program approval must be maintained for the entire term of your project.

If, during the course of your project, you intend to make changes to this study, you must obtain approval from the Human Studies Program prior to implementing any changes. If an Unanticipated Problem occurs during the course of the study, you must notify the Human Studies Program within 24 hours of knowledge of the problem. A formal report must be submitted to the Human Studies Program within 10 days. The definition of "Unanticipated Problem" may be found at: http://hawaii.edu/irb/download/documents/SOPP_101_UP_Reporting.pdf, and the report form may be downloaded here: http://hawaii.edu/irb/download/forms/App_UP_Report.doc.

You are required to maintain complete records pertaining to the use of humans as participants in your research. This includes all information or materials conveyed to and received from participants as well as signed consent forms, data, analyses, and results. These records must be maintained for at least three years following project completion or termination, and they are subject to inspection and review by the Human Studies Program and other authorized agencies.

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Biomedical Sciences Building B104
Honolulu, Hawai'i 96822
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An Equal Opportunity/Affirmative Action Institution

Please notify this office when your project is completed. Upon notification, we will close our files pertaining to your project. Reactivation of the Human Studies Program approval will require a new Human Studies Program application.

Please contact this office if you have any questions or require assistance. We appreciate your cooperation, and wish you success with your research.

APPENDIX I: Outline of Waipahu HART curriculum

Lesson 1: Introduction to Nutrition & Physical Activity

- **Pre-session Requirements**
  - Collect Consent and Assent forms
  - Give Baseline surveys

- **Warm-up**
  - Introduce Team
  - Icebreaker Game
  - Introduction of session topic – Recommendations for Nutrition & Physical Activity

- **Activity**
  - My Plate
  - Healthy Meals
  - Fit in the Middle video
  - HART Activity Game – Physical Activity Challenge

- **Cool-down**
  - Homework: Nutrition Pamphlet
  - Week 1 Physical Activity – Introduce a goal of getting more involved in physical activity.

Lesson 2: The Ingredients of Physical Activity and Nutrition

- **Warm-up**
  - Introduce Group
  - Collect & discuss homework: Nutrition Pamphlet & Introduction of Goal
  - Introduction of the session topic – FITT & Food Labels

- **Activity**
  - FITT
  - Food Labels
  - Logging steps for the Physical Activity Challenge

- **Cool-down**
  - Homework: 4 Food labels
  - Lesson 2 Physical Activity – Applying FITT principle and evaluating inactivity with family

Lesson 3: Eating the Rainbow & Variety and Intensity in Physical Activity

- **Pre-session Requirements**
  - Collect Homework – Food Labels
  - Discuss Homework

- **Warm-up**
  - Introduction of topic experts
  - Introduction of the session topic

- **Activity**
  - Eating the Rainbow
  - Watch Eating the Rainbow Video
  - Student Read Article "The Color of Nutrition"
  - Eating the Rainbow Activity
  - Variety in Physical Activity

- **Cool-down**
  - Homework - Eat a Different Color Rainbow Everyday (Worksheet)
  - Lesson 3 Physical Activity

Lesson 4 - Eating Out and Working Out

- **Pre-session Requirements**
  - Collect Homework
    - Recipe
    - Copy of a menu from a local restaurant or food truck
  - Discuss Homework

- **Warm-up**
  - Introduction of topic experts
  - Introduction of the session topic

- **Activity**
  - Get smart about eating out
  - Working out (Especially During Special Occasions)

- **Cool-down**
  - Discussion
  - Follow up questionnaire
  - Walk/Run Oahu Results

Lesson 5: Recap on Nutrition & Physical Activity

- **Warm-up**
  - Introduce Team
  - Icebreaker Game
  - Introduction of session topic Recap on Nutrition & Physical Activity

- **Activity**
  - My Plate
  - Reading Nutrition Labels
  - Ways to be Physically Active
  - HART Physical Activity Challenge

- **Cool-down**
  - Homework: Nutrition and Physical Activity Poster
  - Week 1: Physical Activity Moderate & Vigorous Activity

Lesson 6: Encouraging Nutrition & Physical Activity in Your Community

- **Warm-up**
  - Introduce Team
  - Introduction of session topic

- **Activity**
  - Homework review
    - Nutrition and Physical Activity Poster
  - Brainstorming activity:
    - Nutrition and physical activity in social circles
  - Nutrition and physical activity in your family
  - HART Physical Activity Challenge

- **Cool-down**
  - Homework: Logging activity
  - Week 2: Strength based workouts

Lesson 7: Making Small Changes for Nutrition & Physical Activity

- **Warm-up**
  - Introduce Team
  - Introduction of session topic

- **Activity**
  - Homework review
    - Logging Activity
  - Brainstorming activity:
    - Look at your Nutrition and Physical Activity Logs from last week– what changes can you make

- **Small changes**
  - Small nutrition changes
  - Small physical activity changes
  - With a partner come up with your own changes
  - HART Physical Activity Challenge

- **Cool-down**
  - Homework: Do 2 small changes for nutrition and 2 for physical activity – record what you did and how you felt after.
  - Week 3: Try a new flexibility and balancing exercise this week with friends

Lesson 8: Last Class Nutrition & Physical Activity Review

- **Warm-up**
  - Introduce Team
  - Introduction of session topic

- **Activity**
  - Homework review
    - 3 small changes for nutrition
    - 3 small changes for physical activity

- **Review**
  - Classes 1-7
  - Trivia Game

- **Survey and Cool-down**
  - Homework: Eat Healthy and Move More.
  - HART Physical Activity Challenge
  - Week 4: Motivate your family to be more active

APPENDIX J: Waipahu HART PA and Nutrition Questionnaire

HART Physical Activity and Nutrition Questionnaire

Dear student, thank you for participating in the HART Physical Activity and Nutrition survey. Please answer the following questions the best that you can.

1. ID Number

2. Gender
   - ◯ Male
   - ◯ Female

3. Height
   - Feet ☐
   - Inches ☐

4. Weight
   - Pounds ☐

5. Age
   - Years ☐

6. Ethnicity (Please choose one)
   - ◯ American Indian/Alaskan Native
   - ◯ Asian
   - ◯ African American
   - ◯ Native Hawaiian (or other Pacific Islander)
   - ◯ Hispanic/Latino
   - ◯ Filipino
   - ◯ Korean
   - ◯ Chinese
   - ◯ Japanese
   - ◯ White
   - ◯ Other (please specify)

☐

The next six questions are about physical activity. Please choose the number of days a week, and for how long, you do each type of activity when you're NOT in physical education (PE):

7. Strenuous activity (It makes my heart beat quickly and makes me sweat.) Examples are: running, fast bicycling, aerobic dance, roller-blading, fast swimming, soccer, basketball, football, martial arts, hockey, hiking, skiing.

	0 day	1 day	2 days	3 days	4 days	5 days	6 days	7 days
How many days a week do you do this?	◯	◯	◯	◯	◯	◯	◯	◯

8. How many minutes each day do you spend in strenuous activity?

	0	10	20	30	40	50	60+
Minutes in each day	◯	◯	◯	◯	◯	◯	◯

9. Moderate activity (It doesn't make me tired and makes me sweat a little.) Examples are: fast walking, slow bicycling, easy swimming, baseball, softball, tennis, volleyball, ping pong, skateboarding.

	0 day	1 day	2 days	3 days	4 days	5 days	6 days	7 days
How many days a week do you do this?	◯	◯	◯	◯	◯	◯	◯	◯

10. How many minutes each day do you spend in moderate activity?

	0	10	20	30	40	50	60+
Minutes in each day	◯	◯	◯	◯	◯	◯	◯

11. Mild activity (It makes me use little effort and doesn't make me sweat.) Examples are: easy walking, bowling, fishing, golf, yoga.

	0 day	1 day	2 days	3 days	4 days	5 days	6 days	7 days
How many days a week do you do this?	◯	◯	◯	◯	◯	◯	◯	◯

12. How many minutes each day do you spend in mild activity?

	0	10	20	30	40	50	60+
Minutes in each day	◯	◯	◯	◯	◯	◯	◯

13. This question looks at how sure you are to do physical activity when other things get in the way. Please read the following items and choose the answer that best expresses how each item relates to you in your leisure time.

	Not at all sure	Somewhat sure	Moderately sure	Very sure	Completely sure
a. I am sure I can participate in regular physical activity when it is raining or snowing or icy	◯	◯	◯	◯	◯
b. I am sure I can participate in regular physical activity when I am under a lot of stress	◯	◯	◯	◯	◯
c. I am sure I can participate in regular physical activity when I feel I don't have the time	◯	◯	◯	◯	◯
d. I am sure I can participate in regular physical activity when I have to exercise alone	◯	◯	◯	◯	◯
e. I am sure I can participate in regular physical activity when I don't have access to a place for exercise	◯	◯	◯	◯	◯
f. I am sure I can participate in regular physical activity when I am spending time with friends	◯	◯	◯	◯	◯

14. Please choose the answer that describes how you feel about being active.

	Disagree a lot	Disagree a little	Neutral	Agree a little	Agree a lot
a. When I am active, I enjoy it	◯	◯	◯	◯	◯
b. When I am active, my body feels good	◯	◯	◯	◯	◯
c. When I am active, I get something good out of it	◯	◯	◯	◯	◯
d. When I am active, it’s very exciting	◯	◯	◯	◯	◯
e. When I am active, it feels good	◯	◯	◯	◯	◯

15. This question is about regular physical activity. Regular physical activity is:

- Activity that happens for 60 minutes at a time (or more) in a day.
- It must be 5 days (or more) in a week.
- It should be enough to make your heart beat faster and/or make you breathe harder… like fast walking, biking, swimming and aerobics classes.

Do you do regular physical activity, as it is described above? (Please choose one)

◯ No, and I do not plan to start doing regular physical activity in the next 6 months.
◯ No, but I plan to start doing regular physical activity in the next 6 months.
◯ No, but I plan to start doing regular physical activity in the next 30 days.
◯ Yes, I have been doing regular physical activity, but for less than 6 months.
◯ Yes, I have been doing regular physical activity for more than 6 months.

16. Choose "Yes" or "No" to each of the following:

	Yes	No
a. I have many friends at school	◯	◯
b. I have many friends in my neighborhood	◯	◯
c. There are lots of children at school that I play with	◯	◯
d. There are lots of children in my neighborhood that I play with	◯	◯
e. The school teachers encourage the students to play	◯	◯
f. My friends like to play outside	◯	◯
g. My family members encourage me to play	◯	◯
h. There are lots of family members that I play with	◯	◯

17. Please answer each of the following by choosing "True" or "False":

	True	False
a. Clearing the table uses the same amount of energy as playing soccer	◯	◯
b. Your goal should be to eat at least 4 ½ cups of fruits and vegetables per day	◯	◯
c. Healthy eating focuses only on proteins, meat, and steak	◯	◯
d. Healthy eating includes fruits and vegetables	◯	◯
e. You should get at least 120 minutes of exercise a day	◯	◯
f. Energy balance is “calories in = calories out”	◯	◯
g. You can find out how many calories are in the food you eat by looking at the Nutrition Facts on the package	◯	◯

h. Cleaning your room is considered physical activity ◯ ◯

18. On a school day, how many hours a day do you spend watching television and/or videos/DVD? (Please choose one)

	0	1	2	3	4	5	6	7	8	9	10+
Hours	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

19. On a school day, how many hours a day do you spend studying without using a computer? (Please choose one)

	0	1	2	3	4	5	6	7	8	9	10+
Hours	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

20. On a school day, how many hours a day do you spend using the computer for school work? (Please choose one)

	0	1	2	3	4	5	6	7	8	9	10+
Hours	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

21. On a school day, how many hours a day do you spend playing video games (DS, Play station, XBOX, computer games)? (Please choose one)

	0	1	2	3	4	5	6	7	8	9	10+
Hours	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

22. On Saturday/Sunday, how many hours a day do you spend watching television and/or videos/DVD? (Please choose one)

	0	1	2	3	4	5	6	7	8	9	10+
Hours	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

23. On Saturday/Sunday, how many hours a day do you spend studying? (Please choose one)

	0	1	2	3	4	5	6	7	8	9	10+
Hours	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

24. On Saturday/Sunday, how many hours a day do you spend using the computer for school work? (Please choose one)

	0	1	2	3	4	5	6	7	8	9	10+
Hours	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

25. On Saturday/Sunday, how many hours a day do you spend playing video games (DS, Play station, XBOX, computer games)? (Please choose one)

	0	1	2	3	4	5	6	7	8	9	10+
Hours	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

The next question asks about food you ate or drank during the past 7 days. Think about all the meals and snacks you had from the time you got up until you went to bed. **Be sure to include food you ate at home, at school, at restaurants, or anywhere else**.

26. During past 7 days, how many times did you:

	Never during the last week	1 to 3 times per week	4 to 6 times per week	1 time per day	2 times per day	3 times per day	4 or more times per day
a. Drink 100% fruit juices such as orange juice, apple juice, or grape juice? (Do not count punch, Kool-Aid, sports drinks, or other fruit-flavored drinks)	◯	◯	◯	◯	◯	◯	◯
b. Eat fruit? (Do not count fruit juice.)	◯	◯	◯	◯	◯	◯	◯
c. Eat vegetables? (Do not count French fries, fried potatoes, or potato chips.)	◯	◯	◯	◯	◯	◯	◯
d. Drink a can, bottle, or glass of soda/pop, such as Coke, Pepsi, or Sprite? (Do not include diet soda or diet pop.)	◯	◯	◯	◯	◯	◯	◯
e. Drink a glass of milk? (Include the milk you drank in a glass or cup, from a carton, or with cereal. Count the half pint of milk served at school as equal to one glass.)	◯	◯	◯	◯	◯	◯	◯

27. Do you eat 4 ½ cups or more of fruits and vegetables each day? (Please choose one)
(1 cup = 1 small apple = 1 baseball = 1 tennis ball)

◯ No, and I do not plan to start eating 4 ½ cups or more of fruits and vegetables a day in the next 6 months.

◯ No, but I plan to start eating 4 ½ cups or more of fruits and vegetables a day in the next 6 months.

◯ No, but I plan to start eating 4 ½ cups or more of fruits and vegetables a day in the next 30 days.

◯ Yes, I have been eating 4 ½ cups or more of fruits and vegetables a day, but for less than 6 months.

◯ Yes, I have been eating 4 ½ cups or more of fruits and vegetables a day for more than 6 months.

Fruits and Vegetables :

This part looks at how **confident** you are about eating fruits and vegetables in different situations. Please answer using the 5-point scale.

1 = NOT AT ALL CONFIDENT
2 = NOT VERY CONFIDENT
3 = MODERATELY CONFIDENT
4 = VERY CONFIDENT
5 = COMPLETELY CONFIDENT

How CONFIDENT are you that you would be able to eat vegetables and fruits when…?

___ 28. You are eating at a restaurant and having a good time.

___ 29. Your hands and fingers hurt when you have to cut or peel them.

___ 30. It's hard to get to the store to buy fruits and vegetables.

___ 31. You have had a hard day and are not feeling good about yourself.

___ 32. Cooking vegetables is difficult to do.

___ 33. Fruits and vegetables don't taste good to you.

Thank you! Please hand the survey in.

Appendix K: Validity, Reliability, Quantitative, & Qualitative Research

Validity

Validity refers to how accurately an assessment tool measures what it is suppose to measure.[1] There are several ways in which validity can be measured:

Face validity is a subjective assessment of whether or not the assessment tool measures what it is suppose to measure.[2] Anderson et al[3] evaluated the validity and reliability in a nutrition knowledge questionnaire designed for children. They initially did face validity of the questionnaire through individual discussion with a sample of children (8-14 yrs old) at a local breakfast club before further qualitative assessment.[3]

Content validity is how well items in the assessment tool adequately covers the domain it is suppose to assess.[2] Haely et al[4] examined content validity of the Pediatric Evaluation of Disability Inventory, a comprehensive functional assessment instrument for pediatric rehabilitation. A total of 35 experts in pediatric rehabilitation were select to comprise the content validity panel.[4] Experts took a validity questionnaire consisting of 9 questions that addressed content validity of the overall test, the 4 domains (self-care, mobility, toileting and social cognition) and individual items.[4] Results showed 80% of judges rated the questionnaire as good/excellent for content validity and comprehensiveness of the four domains.[4]

Criterion validity is when a new instrument is checked against an external criterion or gold standard that is a direct and independent measure of what the new assessment tool is measuring.[2] Sallis et al[5] validated 7-day Physical Activity Recall (PAR) in adolescents through comparison of heart rate monitor records with recalls of very hard activities on the same day.[5] The validity of the report was supported by a group total correlation of 0.53 ($p<0.001$).[5]

Construct validity is the extent to which a new measure is consistent with the theoretical concept being measured.[2] Deniz and Alsaffar[6] validated the development of a new scale assessing dietary fiber knowledge in a sample of Turkish students. The scale was developed based on current material pertaining to dietary advice and literature on dietary fiber.[6] The questionnaire was administered to two groups (174 nutrition course students and 186 engineering students).[6] Students studying nutrition scored consistently higher than engineering students ($p<0.001$) therefore meeting the criterion for construct validity.[6]

Concurrent validity is the comparison of an assessment tool with another validated criterion or reference measure.[7] Stratton et al[7] compared the malnutrition universal screening tool for adults to 5 other tools in the same patients. The malnutrition universal screening tool had excellent agreement with (k 0.77-0.89) with three of the five tools.[7]

Reliability

Reliability is the degree to which an assessment tool produces stable and consistent results.[1] There are several different ways to assess reliability:

Test-Retest reliability is administering the same assessment tool to the same group under the same conditions on two different occasions then correlating the scores.[8] Deniz and Alsaffar[6] did test-retest reliability of a scale developed to assess dietary fiber knowledge of Turkish students. Scores from 202 Turkish student participants, who took the questionnaire twice, was calculated using Person's correlation.[6] Overall reliability was high ($r=0.90$, $p<0.001$) for the dietary fiber knowledge questionnaire.[6]

Internal consistency reliability is how well all items in an assessment tool is measuring different aspects of the same attribute.[2] Deniz and Alsaffar[6] assessed the internal consistency of a new scale assessing dietary fiber knowledge in Turkish students. Responses from the first

administration of the dietary fiber knowledge questionnaire were used in measuring internal consistency.[6] Cronbach's alpha value for the overall questionnaire was 0.90, making it sufficiently reliable.[6]

Parallel-Forms reliability is used to assess the consistency of results of two assessment tools constructed in the same way from the same content domain.[2] Slee A et al[9] used parallel-forms to test consistency of results of the MUST and mini-nutritional assessment short form in frail older hospital patients. Seventy-eight patients from two hospital wards in Lincoln, UK completed the MUST and MNA-SF.[9] Parallel forms reliability analysis revealed a high degree of variance between the two scales.[9]

Inter-Observer reliability assesses the degree to which different observers give consistent estimates of the same item.[2] Bleda MJ et al[10] did a 12-day inter-observer reliability study on the MNA in institutionalized elderly people. In two long-term geriatric units different trained nurses administered the MNA on two different occasions.[10] A high inter-observer reliability (0.89) was found for the MNA.[10]

Qualitative & Quantitative Research

Qualitative research is exploratory research that is used to gain an understanding of underlying reasons, opinion and motivations.[11] The researcher is usually conducting observing, conducting interviews, and recording behaviors in the field.[12] Story et al[13] qualitatively assessed peer-leaders in a peer-led, school-based nutrition education curriculum for adolescents. The peer-leaders were assessed qualitatively through student feedback on how helpful they felt the peer-leaders were, classroom observation by research staff, and teacher interview asking about the usefulness of the peer-leaders.[13]

Quantitative research is the use of statistical, mathematical or numerical analysis to collect data.[11] The researcher is not a participant, rather a recorder or observer.[12] Stock et al[14] quantitatively examined the results of a peer-led health promotion program for prevention of obesity and eating disorders in elementary school children. The study measurement used to assess the children were a questionnaire assessing healthy-living knowledge, behavior and attitude, a 9-minute fitness run, anthropometric measures, disordered eating symptoms, self-competence and body satisfaction.[14]

References

1. Willett W. Nutritional Epidemiology. 3rd ed. New York, NY: Oxford University Press; 2013:96.

2. Greco L, Walop W, McCarthy R. Questionnaire development: 2. Validity and reliability. *Clinical Epidemiology.* 1987;136:699-700.

3. Anderson AS, Bell A, Adamson A, Moynihan P. A questionnaire assessment of nutrition knowledge – validity and reliability issues. *Public Health Nutr*. 2001;5(3):497-503.

4. Haley S, Coster W, Fass R. A content validity study of the pediatric evaluation of disability inventory. *Pediatr Phys Ther.* 1991;3(4):177-184.

5. Sallis JF, Buono MJ, Roby JJ, Micale FG, Nelson JA. Seven-day recall and other physical activity self-reports in children and adolescents. *Med Sci Sports Exerc.* 1993;25(1):99-108.

6. Deniz M, Alsaffar A. Assessing the validity and reliability of a questionnaire on dietary fiber-related knowledge in a Turkish student populatin. *J Health Popul Nutr.* 2013; 4:497-503.

7. Stratton R, Hackston A, Longmore D et al. Malnutrition in hospital outpatients and inpatients: prevalence, concurrent validity and ease of use of the 'malnutrition universal screening tool'(MUST) for adults. *Br J Nutr.* 2004;92:799-808.

8. McIntire SA, Miller LA. Foundations of psychological testing. Boston, MA: McGraw-Hill; 1999. P. 448.

9. Slee A, Birch D, Stokoe D. A comparison of the malnutrition screening tools, MUST, MNA and bioelectrical impedance assessment in frail older hospital patients. *Clinical Nutrition*. 2015;34:296-301.

10. Bleda MJ, Bolibar I, Pares R, Salva A. Reliability of the mini nutritional assessment (MNA) in institutionalized elderly people. *J Nutr Health Aging*. 2002;6(2):134-137.

11. Harris JE, Gleason PM, Sheean PM et al. An introduction to qualitative research for food and nutrition professionals. *J Am Diet Assoc.* 2009;109:80-90.

12. Qualitative vs Quantitative Research. Virginia Tech University Libraries Web site. http://www.lib.vt.edu/research/methodology/quantitative-qualitative.html Updated 2017. Accessed April 2, 2017.

13. Story M, Lytle LA, Birnbaum AS, Perry CL. Peer-led, school-based nutrition education for young adolescents: feasibility and process evaluation of the TEENS study. *J Sch Health.* 2002;72(3):121-127.

14. Stock S, Miranda C, Evans S, et al. Healthy Buddies: a novel, peer-led health promotion program for the prevention of obesity and eating disorders in children in elementary school. *Pediatrics.* 2007;120(4):e1059-1068.